PREVALENCE AND CORRELATES OF MEDICAL AND LEARNING DISORDERS
AMONG FOOD INSECURE STUDENTS AT APPALACHIAN STATE UNIVERSITY

A Thesis
by
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Abstract

PREVALENCE AND CORRELATES OF MEDICAL AND LEARNING DISORDERS
AMONG FOOD INSECURE STUDENTS AT APPALACHIAN STATE UNIVESITY

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Background: Food insecurity is a public health problem among U.S. college students.

Research has focused on identifying sociodemographic correlates, with few studies

identifying co-existing medical and learning disorders that may make it more challenging for

food insecure students to access an adequate diet. Objectives: Compare rates of food

insecurity (FI) among university students with and without medical disorders and identify

associated correlates. Materials and methods: An online questionnaire measured FI using the

USDA Adult Food Security Survey (AFSS), coping strategies and perceived barriers for food

access, academic progress, and identified medical disorders and demographics. Descriptive

and inferential procedures were computed for measurements and comparisons. Statistical

significance was p <0.05. Results: 437 of 6,000 recruited students (7.3%) submitted complete

questionnaires. 237 (56.5%) were FI. FI students were 20% male, 60% female, and 20%

"other", mean age 21.4 years (± 2.74, range 18 – 40), and approximately 75% non-Hispanic

white. Two-thirds of FI students had one or more medical disorders, including psychiatric

(40.5%) and gastrointestinal (31.6%). Coping strategies for students with and without medical disorders, respectively, included "brought food back to school" (90.9% vs. 63.0%) and "ate less healthy food to eat more" (77.7% vs. 49.4%). FI students with disorders had significantly more medical expenses ($p < 0.01$), and their barriers for food access included "feel overwhelmed making food choices" (12.7%) and "meal plan runs out" (10.2%). Correlates for FI for students with medical disorders included female gender, employed, off-campus residence, receiving financial aid, "good/excellent" perceived health, greater use of coping strategies and more perceived barriers for accessing food, and suboptimal academic progress, all $p < 0.05$. Conclusion: FI is more common among students with medical disorders. Findings indicate a need for continued efforts to facilitate food access by FI students, especially for those with medical and learning disorders.

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I want to express my immense gratitude to my advisor, Dr. Laura McArthur for her endless guidance and patient editing of this work. I would like to express my deepest appreciation to my committee member, Dr. Melissa Gutschall who has provided extensive professional guidance throughout my undergraduate and graduate years. I would also like to thank Dr. Kyle Thompson for her dedication to my committee, Dr. Kimberly Fasczewski for her assistance with data analysis, and student participants. Lastly, I must express my very profound gratitude to my parents and friends for providing me with unfailing support and continuous encouragement throughout my schooling.

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<div align="center">**Chapter One**</div>

Introduction

1.1 Background

Food insecurity means having limited or uncertain access, in socially acceptable ways, to a safe and nutritionally adequate food supply that promotes an active and healthy life for all household members, while hunger refers to the physiological responses of the body to food insecurity (https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/). The United States Department of Agriculture Economic Research Service (USDAERS) developed the 10-item Adult Food Security Survey Module (AFSSM) and the extended 18-item Household Food Security Survey Module (HFSSM) to measure the food security status of individuals and households in the United States, respectively (http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement.aspx). The time frame covered by the survey items is the previous 12 months, and depending on the number of affirmative responses selected, food security status can range from high food secure to very low food secure. High food security indicates that, over the previous 12 months, individuals or households experienced no difficulty or anxiety related to consistently accessing adequate food. Marginal food security implies that problems accessing food arose occasionally, however the quality and quantity of the available diet was not significantly reduced. Low food security exists when the quality and variety of foods were reduced, but the normal eating pattern was maintained. Very low food security indicates that, at some point during the previous 12 months, the usual eating pattern was disrupted and the quantity of food consumed was reduced due to a lack of sufficient funds or other resources to access food (https://www.ers.usda.gov/topics/food-nutrition-assistance/food-

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security-in-the-us/). Findings from the HFSSM indicated that an estimated 11.8% (15.0 million) of U.S. households were food insecure at some time during 2017, with a prevalence of very low food security of 4.5%. These findings reflect a decrease in the prevalence of household food insecurity from 12.3% reported in 2016 (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2017). Additionally, data from the HFSSM between 2015 to 2017 showed that the rate of food insecurity in North Carolina exceeded the national prevalence at 14.4% (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2017).

Researchers have identified subgroups of the U.S. population as vulnerable to food insecurity, including households with children, households headed by African Americans and Hispanics, and households with annual incomes at or below the poverty level (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2017). College students have been identified as another vulnerable population for food insecurity (Bruening, Argo, Payne-Sturges, & Laska, 2017), with rates ranging from 14.8% at an urban university in Alabama (Gaines, Knol, Robb, & Sickler, 2014) to 59.0% at a rural university in Oregon (Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez, 2014).

The correlates associated with college student food insecurity include: financial independence, receiving financial aid, credit card debt, lack of budgeting and food preparation skills, and identifying with a racial/ethnic minority (Gaines, Robb, Knol, & Sickler, 2014). While the coping strategies for accessing food used by this population include: eating less healthy foods to eat more, eating smaller portions, stretching food to make it last longer, having one or more part-time jobs while in school, using a credit card to buy food, planning menus before buying food, and receiving food from other family members (Gaines, Robb, Knol, & Sickler, 2014; Patton-Lopez, Lopez-Cevallos, Cancel-

Tirado, & Vazquez, 2014; Watson, Malan, Glik, & Martinez, 2017; McArthur, Ball, Danek, & Holbert, 2018).

1.2 Study Objectives and Justification

The objectives of this descriptive, cross-sectional survey research were to 1) measure the prevalence of food insecurity among students with and without one or more diagnosed medical or learning disorders attending Appalachian State University (ASU) during the spring, 2018 semester, and 2) to compare food insecure students with and without such disorders on the following correlates: coping strategies for accessing food, money expenditure behaviors, perceived barriers to accessing food on or off campus, sources of social and financial support, indicators of academic progress, sociodemographic, anthropometric, health, cooking, and dietary variables.

The term "medical disorder" as used in this thesis refers to a physical or mental condition that is not normal or healthy(http://www.who.int/kobe_centre/ageing/ahp_vol5_glossary.pdf) and the term "learning disorder" refers to a range of neurologically based disorders that interfere with skills such as organization, time planning, abstract reasoning, long or short-term memory and attention (https://ldaamerica.org/types-of-learning-disabilities/). Accordingly, the term "students with disorders" refers to the participants who indicated that they had been diagnosed by a health care professional with one or more of the conditions listed in the questionnaire by selecting all that applied; these participants are also referred to as the "diagnosed students." The "students without disorders" refers to those participants who did not select any of the listed disorders; these participants are also referred to as the "undiagnosed students."

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Most of the research about college student food insecurity has focused on identifying sociodemographic correlates, with little attention given to the potential impacts of medical and learning disorders on their food security. Given that food insecurity can negatively impact psychosocial development, cognitive performance, and physical health (Whitaker, Phillips, & Orzol, 2006; Hadley & Patil, 2008), the findings from this study would inform whether efforts are needed to advocate for state and federal policies and programs that would facilitate greater access to nutritious food by food insecure college students with disorders.

1.3 Study Hypotheses

The following sets of hypotheses were tested to examine the relationship between food insecurity and selected correlates among ASU students with and without a diagnosed medical or learning disorder. Only data from food insecure students were analyzed.

1.3.1 Hypotheses Concerning Sociodemographic Correlates

1) Males and females with disorders will have a significantly higher prevalence of food insecurity than males and females without disorders.

2) Males with disorders will have a significantly higher prevalence of food insecurity than females with disorders.

3) Students with medical disorders will have a significantly higher prevalence of food insecurity than students without such disorders.

4) Students with learning disorders will have a significantly higher prevalence of food insecurity than students without such disorders.

5) Off-campus residents with disorders will have a significantly higher prevalence of food insecurity than on-campus residents with disorders.

6) Lower level students (freshmen and sophomores), upper level students (juniors and seniors), and graduate students with disorders will have a significantly higher prevalence of food insecurity than lower level, upper level, and graduate students without disorders.

7) Among students with and without disorders, there will be significant inverse correlations between their AFSSM scores and their personal monthly and annual family incomes.

8) Students with disorders will identify a greater number of sources of social support as those they believe will improve their food access than students without disorders.

1.3.2 Hypotheses Concerning Coping Strategies for Accessing Food

1) Students with disorders will use a significantly greater number of strategies from the Coping Strategies Scale (CSS) than students without disorders.

2) Among students with and without disorders, there will be a significant positive correlation between their AFSSM and CSS scores.

3) The two coping strategies receiving the greatest number of "sometimes/often" responses from the students with and without disorders will be "plan menus before buying food" and "brought food back to school after visiting family, friends, significant others, etc."

1.3.3 Hypotheses Concerning Money Spending Behavior

1) The two items purchased "sometimes/often" with the greatest frequency by the students with and without disorders will be "gasoline" and "personal items."

2) Among students with disorders, there will be a significant positive correlation between their AFSSM and Money Expenditure Scale (MES) scores.

1.3.4 Hypotheses Concerning Perceived Barriers to Food Access

1) Students with disorders will identify a significantly greater number of barriers on and off-campus than students without disorders.

2) Among students with and without disorders, there will be a significant positive correlation between their AFSSM scores and the number of barriers on and off campus.

1.3.5 Hypotheses Concerning Academic Performance

1) Students with disorders will earn a significantly lower mean score on the Academic Progress Scale (APS) than students without disorders.

2) Among students with and without disorders, there will be a significant negative correlation between their AFSSM scores and their GPA.

1.3.6 Hypotheses Concerning Perceived Health Status

1) A significantly greater proportion of students with disorders will rate their perceived health status as "fair/poor" than students without disorders.

2) A significantly greater proportion of students with disorders will report spending money "sometime/often" on health care related items than students without disorders.

1.3.7 Hypotheses Concerning Cooking Competence

1) Students with and without disorders will rate their cooking skills as "good/excellent."

1.3.8 Hypotheses Concerning Dietary Patterns

1) Among students with and without disorders, there will be a significant negative correlation between their AFSSM scores and their frequency of consuming fruits and vegetables.

2) Among students with and without disorders, there will be a significant positive correlation between their AFSSM scores and their frequency of consuming sweets.

3) A majority of students with and without disorders will indicate that they would like to consume fruits and vegetables more often.

Chapter Two

Review of the Literature

2.1 Prevalence and Correlates of Food Insecurity Among U.S. College Students

Food insecurity affected 15.0 million U.S. households (11.8%) in 2017 (Coleman-Jenson, Rabbit, Singh, 2017). Mounting evidence from U.S. campuses indicates that college students are one of the population subgroups at-risk for food insecurity (Bruening, Argo, Payne-Sturges, & Laska, 2018). Students from low income families who are transitioning to post-secondary education experience new financial burdens and related stressors which may result in higher rates of food insecurity (Pancer, Hunsberger, Pratt, & Alisat, 2000; Kerr, Johnson, Gans, Krumrine, 2004). The transitional period and new-found autonomy are coupled with new social and environmental barriers that may be related to a students' overall health and wellbeing (Canson & Wenrich, 2002; Parker, Summerfeldt, Hogan, & Majeski, 2004).

Most of the research on college student food insecurity has focused on identifying sociodemographic correlates, with little attention paid to the potential unfavorable impacts of physical and mental health problems and learning disorders on the students' ability to access an adequate diet (Wall-Bassett, 2017). Yet, several studies have shown that households that include a person with a disability are significantly more likely to be food insecure (Coleman-Jenson & Nord, 2013; Houtenville & Brucker, 2014; Brucker, Mitra, Chaitoo, & Mauro, 2015). In the U.S. an estimated 40 million people have an ambulatory, cognitive, or sensory disability that prevents them from working well-paid jobs (Houtenville, Brucker, Lauer, 2014). Young adults with disabilities encounter challenges in addition to the difficulties associated with their condition, such as economic, health, and social disadvantages (Albrecht

& Devlieger, 1999; Coleman-Jenson, 2003).

Brucker & Nord (2016) analyzed the levels of food insecurity among young adults with and without disabilities. Data from the 2011-2013 National Health Interview Survey (NHIS) were analyzed and included 32,795 young adults (age 18-25) with and without disabilities. Logistic regression revealed that the participants with disabilities have significantly higher odds (OR: 2.58, $p < 0.001$) of living in a household that is food insecure compared to participants without disabilities. In addition, the odds of living in a food insecure household were also high (OR: 5.35, $p < 0.001$) among participants with exacerbated levels of psychological distress. These findings suggest that young adults with disabilities are at an increased risk of being food insecure. Keogh, Kushalnagar, and Engleman (2018) examined whether peer support and demographic characteristics predict food security among deaf college students. Participants ($N = 166$) completed a bilingual online survey in American Sign Language and English. The survey included the USDA's 6-item food security module, questions regarding peer support, and sociodemographic characteristics. Findings indicated that of the 166 students, 60.7% were food secure, 26.4% low food secure, and 12.9% very low food secure. Compared to people who reported always receiving peer support, people who never received peer support were 16.3 times more likely to experience food insecurity (OR: 16.325, 95% CI 1.824-146.107). These findings suggest a relationship between peer support and the food security status of deaf college students.

A negative consequence of food insecurity is an increase in the occurrence of stress and anxiety (Whitaker, Phillips, & Orzol, 2006; Hadley & Patil, 2008). It has also been observed that food insecurity is higher among those with severe psychiatric disorders (Goetz, 2008). Mangurian, Sreshta, & Seligman (2013) found a significantly higher prevalence of

food insecurity among those with severe mental illness compared to other populations, noting the relationship between mental health and food security status. Martinez, Frongillo, Leung, and Ritchie (2018) investigated the relationship between food insecurity, mental health, and academic performance among college students. A cross-sectional study design was used to collect data from 10 college campuses in California. A total of 67,645 students were recruited. Food insecurity was measured using the USDA 6-item short form. GPA was self-reported, while mental health was measured using the National College Health Assessment II survey. On average, the participants (N = 8,705) were 23 years old, and 67% identified as female. When reporting their grade point average (GPA), 42% reported an A and 44% reported a B. Roughly 15% of students reported experiencing tremendous stress, and 28%-55% reported either feeling very sad, lonely, hopeless, and/or overwhelming anxiety and depression. Food security scores indicated that 40% of students experienced food insecurity sometime in the previous 12 months. A significantly higher proportion of food insecure students than food secure students self-reported a lower GPA. Additionally, students experiencing food insecurity had significantly higher proportions of mental health indicators than their food secure peers, $p < 0.05$.

Bruening, Brennhofer, Woerden, Todd, and Laska (2016) measured the prevalence of food insecurity and examined health behaviors among food secure and food insecure college freshman. An online questionnaire was distributed during the 2014-2015 academic year to 209 freshmen who were living in an on-campus residence hall. The students' mean age was 18.8±0.5 years and 62% were females. The 128-item survey was designed to elicit information regarding food security status, demographic characteristics, and social-environmental factors related to nutrition, physical activity, and weight. The authors found

that 32% of the students had experienced inconsistent access to safe and adequate food in the past month and 37% in the past 3 months. Food insecure college freshman had significantly higher rates of depression (95% CI: 1.58 to 5.60; p < 0.001) compared to their food secure peers. The food insecure students also had significantly lower odds of consuming breakfast, consuming home-cooked meals, receiving food from parents, and perceiving their off-campus eating habits to be healthy (p < 0.05). A follow-up study conducted by these authors investigated the longitudinal associations between food insecurity and health behaviors/outcomes among a sample of 1,138 college freshman who had participated in the Social Impact of Physical Activity and Nutrition in College Study (Bruening, van Woerden, Todd, and Laska, 2018). The sample was 65% female and 49% non-white. These students completed surveys on health behaviors during the 2015-2016 academic year. Their eating behaviors were measured using the 26-item Dietary Screener Questionnaire (DSQ) and their food security status was measured using the USDA 6-item short form. Indicators of mental health, alcohol use behaviors, body composition, and physical activity were also examined. Findings indicated that food insecurity was significantly higher at the end of their first and second semesters (35% and 36%, respectively) than at the beginning of the academic year (28%). Food insecurity was not found to be related to any health behaviors/outcomes when analyzed longitudinally. However, food insecurity was inversely related to breakfast consumption on most days of the week (OR: 0.67, 99% CI = 0.46, 0.99), daily evening meal consumption (OR: 0.55, 99% CI = 0.36, 0.86), healthy eating habits on campus (OR: 0.68, 99% CI = 0.46, 1.00), healthy physical activity habits on campus (OR: 0.66, 99% CI = 0.44, 1.00), and positively related to the likelihood of experiencing stress (OR: 1.69, 99% CI = 1.16, 2.46) and depressed mood (OR: 1.98, 99% CI = 1.34, 2.91). Findings from this study

suggest that food insecurity was related to poorer eating patterns, physical activity behaviors, and mental health.

Wall-Bassett, Yanju, and Matthews (2017) analyzed the possible association between student food insecurity and stress. A cross-sectional study was conducted to examine student food security status using a questionnaire that included the USDA Household Food Security Survey Module (HFSSM) and questions associated with stress. Participants (n = 381) were recruited from a rural college in North Carolina. Findings revealed that 38% of students were food insecure. In addition, there was a significant difference in the mean food security and stress scores between food secure and food insecure students (p = .004). Bonferroni test yielded a statistically significant difference between very low food security and high food security (p = .008). The authors concluded that the students with very low food security had significantly higher stress levels compared to the students who were more food secure. A similar study conducted by Laitner et al. (2016) assessed the relationship of food insecurity and various health behaviors such as sleep quality, dietary pattern, body mass index (BMI), and stress levels among a sample of college freshmen. The authors found that 266 students (27.5%) of the sample were food insecure. An independent samples t-test indicated that food secure students had significantly lower BMIs (t (392.2) = -2.88, p = 0.004), lower stress levels (t (1033) = 5.93, p < 0.001), and better sleep quality (t (1033) = 5.79, p < 0.001) compared to their food insecure peers. These findings suggest that food insecure college freshmen possess poorer health-related behaviors.

Hagedorn et al. (2017) estimated the prevalence of food insecurity and health correlates among students attending West Virginia University (WVU). A 56-item questionnaire was emailed to 1,191 professors requesting that they administer it to their

students during the fall 2016 semester. A total of 639 undergraduate and graduate students submitted questionnaires. Their mean age was 21 ($\pm$ 4 years), and they were predominately single (94%), Caucasian (89%), and female (71%). Findings indicated that 244 of the sample (35%) were food insecure, with 91 (60%) of these students reporting fair or poor health. Additionally, the food insecure students had higher mean weight (161.1 $\pm$ 39.8 lb) compared to their food secure peers (155 $\pm$ 35.4 lb). Findings from this study support the relationship between food insecurity and poorer health outcomes in college students.

Payne-Sturges, Tjaden, Caldeira, Vincent, and Arria (2018) aimed to estimate the prevalence of food insecurity among students and investigate the association between food insecurity and demographic characteristics, financial risk factors, mental and physical health, and academic performance. A cross-sectional survey design was used to collect data from 237 undergraduate students attending a large public university during the fall of 2015. The USDA 18-item HFFSM was used to measure food insecurity among student participants. Among the surveyed students, 15% were food insecure and an additional 16% were at risk for food insecurity. Findings suggested that students who were African American, receiving multiple forms of financial aid, or experiencing housing instability were more likely to be food insecure or at risk for food insecurity (Adjusted Odds Ratio [AOR] = 4.00, 95% CI: 1.83-8.71, $p < 0.001$; AOR = 5.26, 95% CI: 1.85-14.98, $p = 0.002$; AOR = 3.43, 95% CI: 1.85-6.37, $p < 0.01$; AOR = 8.00, 95% CI: 3.57-17.93, $p < .01$, respectively). Additionally, food insecure students were more likely to self-report depressive symptoms compared to their food secure peers.

Disordered eating patterns and behaviors can be attributed to food insecurity, as well as decreased quality and quantity of foods consumed (Tester, Lang, & Laraia, 2016). Knol, Robb, McKinley, and Wood (2017) examined the relationship between food insecurity and self-rated health and obesity among college students residing off campus. An online survey was used to measure student food security status and elicit information regarding health status and height and weight. A total sample of 351 students were included in the statistical analyses. Data indicated that food insecurity was not associated with obesity, however food insecure students had significantly higher rates of fair/poor health status when compared to their food secure peers (OR: 2.1, 95% CI = 1.1, 4.3).

Knol et al. (2017) aimed to determine the relationship between mindful eating practices and food insecurity among a sample of undergraduate college students (n = 495). Participants completed a questionnaire that included the Mindful Eating Survey and the USDA Adult Food Security Module. Statistical analysis indicated that the overall prevalence of food insecurity was 37.2%. The average overall mindful eating score was 3.33 ± 0.39. Compared to food secure students, food insecure students had significantly lower mindful eating scores (p = 0.01), external cues scores (p = 0.01), and significantly higher biological cues scores (p = 0.05). Findings revealed no significant difference in awareness, emotional response, and distraction scores between the groups. These findings suggest that food insecure students were more responsive to their hunger and satiety cues in comparison to their food secure peers.

Researchers have suggested that the absence of food management skills can increase an individuals' risk of being food insecure (Anderson and Swanson, 2002; Alaimo, 2005). Larson et al. (2006) reported that many young adults lack the cooking skills necessary for

independent living, in addition to the money and time to purchase and prepare foods. Gaines,

Robb, Knol, & Stickler (2012) examined the association between food insecurity and

cooking self-efficacy and food preparation resources. Undergraduate students from a large,

public university were recruited to participate in the study. Five hundred and ninety-eight

students completed an in-class administered questionnaire that included a version of the

USDA Adult Food Security Survey Module as well as questions designed to elicit perceived

food preparation skills, cooking self-efficacy, and available resources. Analysis indicated that

over half of the sample were food secure (64.1%) and 9.1% and 5.7% of students were

classified as low food secure and very low food secure, respectively. Additionally, findings

suggest that as food insecurity increased, students reported significant decreases in self-

efficacy for cooking nutritious meals (p = 0.004), perceived cooking skills (p = 0.003),

money to purchase food (p < 0.001), and time for food preparation (p = 0.001).

Gaines, Robb, Knol, & Stickler (2014) also assessed food security, food management

skills and financial resources among a sample of college students using data obtained from

the 2007-2008 National Health and Nutrition Examination Survey (NHANES). Food security

status was measured using the 10-item USDA AFSSM, while other validated measures were

used to assess self-efficacy towards cooking and skill adequacy (Larson et al., 2006). Of the

student participants (n = 557), the majority of students reported high food security, however

20% experienced anxiety about their food supply and 14% had experienced altered food

intakes within the previous year. Findings suggest that most students reported a high cooking

self-efficacy. An ANOVA yielded significant differences between food security and cooking

self-efficacy (p = 0.029) and perceived resource adequacy (p < 0.0001). Additionally, post

hoc testing indicated that high food secure students reported significantly high cooking self-

efficacy compared to their peers (p ≤ 0.05). It was found that both high and marginal food secure students perceived greater resource adequacy than their food insecure peers (p ≤ 0.05). Lastly, it was found that students who received financial aid (p = 0.011), some form of food assistance (p = 0.003), and financially independent (p = 0.001) were at a greater risk of being food insecure.

Broton and Goldrick-Rab (2018) used data from prior studies to better estimate the incidence of food and housing insecurity among community college and 4-year university students. The investigation was conducted to bring needed attention to the material hardships related to food access and housing stability students face because of the increasing costs associated with higher education. Data were collected from four separate studies and included over 30,000 students attending either a two- or four-year college. In each study, over half of the student participants reported some level of food insecurity. More specifically, among the community college students, between 11% and 38% were very low food secure and among the 4-year university students, between 9% and 25% were very low food secure. Data suggested that the most common food insecurity repercussions included the inability to afford to eat balanced meals and cutting the size of meals or skipping meals altogether because of lack of sufficient funds to purchase food. In terms of housing instability, students attending a 2-year colleges were statistically more likely to report housing challenges than those attending a 4-year university. Among the community college students, roughly one-third reported that they had experienced a form of housing insecurity in the previous year. The most common challenge included difficulty in paying rent/mortgage. However, homelessness was the most severe form of housing insecurity, with a prevalence ranging from 6% to 14% among student participants attending a community college. Additionally,

findings indicated that students who had recently experienced homelessness were significantly less likely to be employed that those who had not 58% of homeless students were currently employed compared with 63% of those with a home (p < 0.05). Such findings bring attention to the material challenges that college students face because of the heightened post-secondary education expenses.

A survey study conducted at City University New York (CUNY) during the 2010 summer and fall semester examined the prevalence of food insecurity, housing instability, and mental health issues among a representative sample of undergraduate students (n =1,114) (Freudenberg et al., 2011). The survey design included four questions about food experiences in the previous year as well as questions used to evoke information regarding housing instability and psychological problems. Findings indicated that 39.2% of CUNY students had experienced food insecurity in the past year. Findings also indicated that 24.3% of CUNY students experienced both food insecurity and housing instability. The Black and Latino students were roughly 1.5 times more likely to experience food insecurity than Caucasian and Asian ethnicities. These findings suggest that many CUNY students experience some degree of food insecurity and that current programs available to students are not adequately addressing the issue.

Halfacre, Chang, Roseman, and Holben (2017) studied the relationship between heightened financial hardships and food insecurity among college students, as well as the associated influences that financial strain has on eating behaviors. A representative sample of 2,000 undergraduate students attending a Southern state university were asked to complete an online questionnaire. The questionnaire elicited information regarding students' food security status, food preparation ability (FPA), demographics, and financial status. Statistical analysis

revealed that 46.1% of participating undergraduate students were food insecure, while 24.7% were very low food secure. On average, students consumed 2.32 servings of fruits and vegetables per day. Additionally, student loans (n = 42, 47.2%) were positively correlated with very low food security (r = .24, p < 0.05), but not with fruit and vegetable consumption. Food budgeting and shopping, a fundamental component of FPA, was a negative predictor of food insecurity (r = .26, p < 0.05), while cooking skills were a positive predictor of fruit and vegetable consumption (r =.27, p < 0.05) among females only. In conclusion, these findings indicate that student loans, an indicator of financial burden, were related with a very low food secure status.

A study performed at the University of Alabama assessed the prevalence of food insecurity and the relationship between food insecurity and potential risk factors such as personal income, family financial support, student debt, credit card use, and food and financial management skills (Gaines, Robb, Knol, & Sickler, 2014). A questionnaire was designed to determine food security status, food management skills, demographic information, and financial resources. A total of 557 students were included in the final analysis. Data revealed that most students reported high food security; however, 20.02% experienced anxiety about their food access and 14.06% had experienced altered food intake within the previous year due to lack of sufficient funds (8.91% low food security, 5.15% very low food security). An ANOVA analysis yielded a significant difference in terms of food insecurity based on cooking self-efficacy (p = 0.029) and perceived resource sufficiency (p < 0.001). In addition, participants who received financial aid (p = 0.011) or food assistance (p = 0.003) or were financially independent (p = 0.001) were at a significantly greater risk for food insecurity.

The impact that food insecurity has on cognitive, academic, and psychosocial development among students is well-documented. The literature has consistently reported that food insecurity is correlated with a poorer academic performance, health, and decreased psychosocial function (Alaimo, Olson, & Frongillo, 2001). Among college students, food insecurity may be the aftereffect of the 2012 federal aid changes, which resulted in an increase in the cost of post-secondary education and exacerbated the financial stressors students already face (Hopkins, 2012; Hughes, 2009).

Phillips, McDaniel, and Croft (2018) aimed to investigate how food insecurity impacts academic success with a particular focus on demographic differences among undergraduate students attending a Midwestern university. Data were obtained from an online student financial wellness survey distributed to a random sample of 5,000 students. Food security data indicated that 63.4% of the sample of 508 students were food secure, 21.9% experienced low food security, and 14.8% experienced very low food security. Findings revealed no significant differences in food insecurity by gender, academic year, or employment status. However, African American students were significantly more likely to be food insecure than students of other races/ethnicities ($p < 0.05$). Additionally, it was found that first generation students had 1.72 times greater odds of being food insecure than non-first-generation students. Students who were financially independent had 2.18 times greater odds of being food insecure than those students' dependent on their parents. Furthermore, students with debt and students residing off-campus also had higher odds of being food insecure. Data related to academic success indicated that food insecure students had 3.42 times greater odds of reporting neglecting academic studies than their food secure peers. In

conclusion, these findings suggest that students who experience food insecurity and debt were more likely to experience disruptions in their academic endeavors.

Those residing in more rural locations face heightened challenges accessing affordable food when compared to urban consumers (USDA, 1999). Students residing in geographically rural areas may face similar challenges, putting them at an increased risk of being food insecure. Patton-Lopez, Lopez-Cervallos, Cancel-Tirado, and Vazquez (2014) examined the prevalence and related correlates of food insecurity among students attending a rural university in Oregon. A cross-sectional, 40-item online survey was distributed via email to all students (N= 5,438) enrolled at the university during the 2011 academic year. The food security status of participants was determined by using the 6-item USDA Food Security Survey Module. Findings revealed that 59% (n =208) of participating students were food insecure at some point during the previous year. Variables such as fair/poor health status (OR: 2.08; 95% CI, 1.07-4.63, p = 0.03), being employed (OR: 1.73; 95% CI:1.04-2.88, p = 0.04), and having an income < $15,000/year (OR: 2.23; 95% CI: 1.07-4.63, p = 0.03) were considered predictor variables of food insecurity among this sample. In addition, food insecure students were significantly less likely to obtain good academic performance and achievement (grade point average of ≥ 3.1) (p < 0.001).

McArthur, Fasczewski, Wartinger, & Miller (2018) assessed family and on-campus food insecurity among a non-probability sample of freshman attending Appalachian State University. A cross-sectional, anonymous, questionnaire was distributed to a randomized sample of all freshmen attending the university (n = 2744) during the spring, 2017 semester. A total of 456 students with a mean age of 18.5 years (±1.04, range 18-33) were included in the final analysis. Scores from the 10-item USDA AFSSM suggest that family and campus

food insecurity were experienced by 32 (7.1%) and 98 (21.5%) of the students, respectively, and 42.5% of those food insecure students reported that their food access further declined since beginning college. Correlation analysis yielded a significant association between family AFSSM scores and scores on the Coping Strategies Scale (CSS) ($r = .52$, $p < 0.01$). Additionally, a significant positive correlation was found between the students' AFSSM and their scores on the CSS ($r = .26$, $p < 0.05$). Further analysis indicated that food secure students scored significantly higher on self-rated measures of academic progress ($p < 0.01$), and significantly greater proportions of food secure students (60.7 vs. 43.9%, $p < 0.01$) perceived their dietary pattern as "healthy/very healthy," and perceived their health status as "good/excellent" (86.0 vs. 71.4%, $p < 0.01$).

McArthur, Ball, Danek, and Holbert (2018) aimed to determine the prevalence and related correlates of food insecurity among a sample of college students attending Appalachian State University during the 2015-2016 academic year. A cross-sectional, anonymous, 73-item questionnaire was distributed to a randomized sample of 6,000 sophomore through graduate students enrolled at the university. The questionnaire elicited information regarding the students' food security status, money expenditure behaviors, coping strategies, academic progress, and demographics. Data revealed that of the student participants (n=1,093, 26%), 239 students experienced low food security (21.9%) and 266 students experienced very low food security (24.3%) in the past 12 months. Predictor variables of food insecurity were higher money expenditure and coping strategy scale (CSS) scores, lower grade point averages, male gender, receiving financial aid, fair or poor self-rated health status, and never cooking for self or others. The most frequently used coping strategies were purchasing cheap, processed food (n = 282, 57.4%), stretching food (n = 199,

40.5%), and eating less healthy meals to eat more (n= 174, 35.4%). In addition, higher participant scores on the CSS were positively correlated with higher scores on the Adult Food Security Survey (AFSS) (r = .42, p = < 0.001). These findings suggest a high prevalence of food insecurity among the college sample, similar to findings in previous studies (Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez, 2014; Gaines, Knol, Robb, & Sickler, 2014).

A similar study conducted by Hagedorn and Olfert (2018) also assessed the prevalence of food insecurity among a nonprobability sample of students attending a rural university in Appalachia. A cross-sectional survey elicited information regarding the students' food security status, money expenditure behaviors, coping strategies for accessing food, academic progress, and sociodemographic information. Among the 692 participants, 36.6% were food insecure. The students with higher scores on money expenditure and coping strategies scales had significantly higher odds of being food insecure (OR = 2.07; 95% CI 1.81 to 2.38 and OR = 1.20; 95% CI 1.16 to 1.23, respectively). Regression analysis indicated that scores on the money expenditure and coping strategies scales, perceived health status, and academic year were all significant predictors of food insecurity.

Mukigi et al. (2018) investigated the correlates of college student food insecurity, including coping strategies for food access, and the impact food insecurity has on student wellbeing and academic success. This qualitative study used structured interviews to elicit information related to financial status and resources, eating patterns, coping strategies, effects on academics and health, and social support. Participants (n = 17, 71% female) were interviewed with a trained student researcher for 30-45 minutes. Findings identified the following themes: history of food insecurity; competing financial demands; coping with food

insecurity; effects of food insecurity on academics; effects of food insecurity on health; and role of support systems. Most students reported experiencing food insecurity prior to college, however some became food insecure when they joined college. Common sources of money expenditure were utility bills, medical bills, and unexpected expenses. In addition, common coping strategies used by these students were cutting the size of meals and skipping meals to ensure they had food. In terms of social support, some students felt comfortable using an on-campus food pantry while others felt they didn't deserve food assistance. This study found comparative results to previously conducted studies, suggesting that food insecurity is common among college students and is worsened by the increasing cost of attending college.

A study conducted at four state universities in Illinois was designed to measure the food security status of enrolled students and determine the associated sociodemographic variables (Morris, Smith, Davis, & Null, 2016). A cross-sectional survey containing the Household Food Security Survey Module was distributed via email to a sample of 48,658 students. Out of the student participants (n=1,882, 33.4% male, 66.6% female), 35% of students were considered to be food insecure. Chi square analysis yielded a significant positive correlation between food security status and race, grade point average, use of financial aid, and living location ($p < 0.001$).

Wood and Harris (2018) sought to determine which race/ethnic student group experience food insecurity and which challenges are predictive of acute food insecurity. Data were collected from the Community College Success Measure (CCSM), a validated measure used to examine the challenges facing underserved students. Data from 6,103 students were included in the final analyses. Findings indicated that food insecurity was found to differ significantly across race/ethnic groups, ($\chi^2 = 41.51$, $p < 0.001$). It was found that multiethnic

students had the highest rate of food insecurity (16.5%), followed by African Americans (16.0%). Predictors of food insecurity included having a low income ($30,000 or lower) for White and Asian students and being enrolled full-time for Latino students only. Additionally, for all race/ethnic groups, health challenges were determinants of food insecurity. Lastly, difficult relationships were predictive for White (OR: 1.75), Asian (OR: 2.21, $p < 0.001$), and African American students (OR: 1.77, $p < 0.05$). The findings from this study suggest that external challenges may influence a students' food security and such challenges may vary by race/ethnicity.

Forman, Mangini, Dong, Hernandez, and Fingerman (2018) estimated the prevalence of food insecurity and hunger and identified related correlates among a sample of undergraduate students (N = 1,069; 58% women; 42% non-Hispanic White). A cross-sectional survey was used to elicit sociodemographic information, financial management skills, and family support, while the USDA 6-item short form was used to measure students' food security status. Findings revealed that 23.5% of students were food insecure at some time in the previous year, with 4% indicating they had experienced food insecurity prior to entering college. Since beginning college, 26.6% of students reported either cutting the size of their meals or skipping meals because money was insufficient for food. Notably, 37% of the food insecure students reported implementing such coping strategies every month. Fifteen percent of students reported ever being hungry and did not eat because they could not afford food. Additionally, data revealed that a higher proportion of food insecure students were: third born or higher; first generation college student; employed; were Hispanic; financially independent; financial aid recipient; and had none or little confidence in managing their finances.

A study performed at a California university investigated the risk factors for food insecurity among a randomized sample of graduate and undergraduate students (Martinez, Brown, & Richie, 2016). Students were sent an email request to participate in an online questionnaire which contained the USDA 6-item FI module in addition to the National College Health Assessment Survey. The final sample included 8,932 students. Data indicated that the prevalence of food insecurity was comparable to national ranges (25-60%). In comparison to food secure students, food insecure students were more likely to be of a minority background (64% vs 20%), and to want on-campus resource information concerning food access (47% vs 25%). These data suggest the food insecurity among the study sample is higher than the national household prevalence (14%).

King (2017) aimed to assess the prevalence and predictors of food insecurity among a sample of college students and identify the barriers that students face accessing food assistance resources. A 37-item online questionnaire was sent to students enrolled at a large Midwestern university. Of the 4,188 participants, 1,495 (35.7%) were food insecure (18.1% low food secure and 17.6% very low food secure). Data indicated that the highest prevalence of food insecurity was among females between the ages of 18 and 24. Students who were very low food secure were more likely to stress about accessing food (OR: 3.3) verse stress about paying for school (OR:1.3) and housing (OR: 1.2). Findings revealed that the perceived barriers to access an on-campus food pantry included lack of knowledge of how to use the food pantry (77.1%), not wanting others to know of need (59%), and not wanting to be served by peers (50%).

Food literacy has been conceptualized as a potential predictor of food insecurity among college students (Cullerton et al., 2012). Food literacy encompasses four domains that include food planning and management, selection, preparation, and eating (Vidgen and Gallegos, 2014). Food literacy may be understood as learned skills, which individuals use to navigate their food environment (Massey et al., 2012; Palumbo, 2016). Watson, Malan, Glik, and Martinez (2017) conducted 11 focus group discussions with 82 students enrolled at UCLA during the 2016 academic year. Food security status was measured using the USDA 6-item food security short form. Discussion topics included food literacy and food security. Of the 82 students who participated in the discussions, 44 (54%) were considered to be food insecure (32% low food secure and 22% very low food secure). The themes that were discussed in the focus groups included awareness, cost of attendance, consequences of food insecurity, and coping with food insecurity. The student participants were aware of socioeconomic inequality among the students attending UCLA and referenced food insecurity as an invisible on-campus problem. Students related the high prevalence of food insecurity to the cost of attendance including tuition and fees, books and supplies, housing, food, transportation, and personal expenses. Additionally, students did not express confidence in their ability to budget their money and felt a lack of financial support from the university. Many students disclosed that worrying about food was a continual stressor that impacted their academic performance in the negative. Students also reported heightened mental and physical health issues such as stress, sleep disturbances, irritability, depression, headaches, and weight gain attributed to limited access to nutritious foods. To cope with food insecurity students reported attending free on-campus meal events, working part-time, and preparing inexpensive staple foods like rice and beans. Lastly student participants discussed

the university's role in to help students attain basic needs such as life skills training and changing aspects of the on-campus food environment (i.e., lower priced foods in dining halls and better meal plans).

2.2 Prevalence and Features of Common Disorders Among U.S. College Students

2.2.1 Autism Spectrum Disorders

Autism Spectrum Disorder (ASD) is a developmental disorder that influences an individuals' communication and behavior. Those with ASD experience an array of challenges such as difficulty with communicating and socializing with others, repetitive behaviors, and symptoms that impact the individuals' capabilities to function normally in academic and work settings (https://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-asd/index.shtml). Whereas, those with High-Functioning Autism Spectrum Disorder (HFASD) meet the clinical criteria for ASD, however also possess an IQ of 70 or higher (Honda, Shimizu, Imai, & Nitto, 2005). Those with HFASD are often verbally skilled and can have the intellectual abilities comparative to their undiagnosed peers (Barnhill, Hagiwara, Myles, & Simpson, 2000; Hayashi, Kato, Igarashi, & Kashima, 2008; Mayes & Calhoun, 2008).

Based on medical records from 2014, the Center for Disease Control (CDC) has increased the national prevalence rate of ASD by 15% (1 in 59 children) (Baio et al., 2018). The annual rate of those with ASD pursing post-secondary education are significantly lower than the general population. Previous studies have suggested a prevalence of less than 40% of such individuals ever attending college and fewer obtaining a degree (Szatmari, Bartolucci, Bremner, Bond, & Rich, 1989; Cederlund, Hagberf, Billstedt, Gillberg, & Gillberg, 2008; Eaves & Ho, 2008). The low rates of young adults with ASD attending

college may be attributed to the challenges of new schedules and routines and the transition into independent living (Howlin, Goode, Hutton, & Rutter, 2004; Jobe & White, 2007).

Shattuck et al., 2012 aimed to investigate the prevalence and correlates of postsecondary education and employment among young adults with ASD. Data were obtained from a survey of parents, guardians, and young adults with an ASD diagnosis. Rates of participation in postsecondary education, employment, as well as absence of participation in such activities were examined. The prevalence rates were compared to individuals with either a speech/language impairment, learning disability, and/or mental retardation. Of the young adults with ASD, 34.7% had attended college and 55.1% had participated in a paid employment opportunity during the first six years after completing high school. Results indicated the young adults with ASD had the lowest rate of participation in employment compared with their peers in the other disability category. In addition, higher income and functional ability were associated with participation in postsecondary education and employment. Findings suggest that young adults with ASD from a low socioeconomic background and those with greater functional limitations are at an increased risk for poor outcomes.

White, Ollendick, and Bray (2011) sought to estimate the prevalence of HFASD and the associated psychiatric risks among a sample of undergraduate students (N= 667). A 50-item questionnaire was used to measure characteristics of autism and related behavioral and psychiatric problems. Analyses were based on a sample of participants with a complete Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001). The AQ was implemented to measure autistic traits among participants, where a higher AQ score is indicative of more symptoms of ASD. Data revealed a mean total AQ score for the sample was 107.66 $\pm$ 14.28,

with no significant gender differences. Additionally, AQ and Social Responsiveness Scale (SRS) scores differed significantly between high-AQ and low-AQ matched groups, (t [24] = 9.10, p < 0.001; t [24] = 5.04, p < 0.001), respectively. In conclusion, characteristics of ASD as determined by the AQ and the SRS were significantly correlated with symptoms of social anxiety, depression, and aggression, indicating that such students are at an increased risk of psychiatric morbidity, all p < 0.01.

Shattuck et al. (2014) aimed to examine the prevalence of disability identification and self-efficacy, and related correlates among college students with ASD. Data were obtained from the National Longitudinal Transition Study 2 (NLTS2). The final study sample included 120 students where, some participants attended a 4-year university (13.9%), while the remaining participants either attended a 2-year college (42.0%) or attended both 2 and 4-year colleges (44.1%). The survey included a yes or no response question for disability identification. Two-thirds (69.4%) of young adults with ASD considered themselves as being disabled or having a special need. Among these participants, a majority (72%) reported a high level of confidence in their ability to get the assistance they need from their university. However, despite the high rate of students with ASD self-identifying as being disabled, those who do not self-report their disability may be unintentionally excluded from the special services provided by education institutions.

Individuals with Asperger Syndrome (AS) and HFAD with an ambition to pursue post-secondary education, encounter a multitude of challenges that are associated with the transition (Sterling, Dawson, Estes, & Greenson, 2008; Hofvander et al., 2009; White, Oswald, Ollendick, & Scahill, 2009; Cederlun, Hagberg, & Gillberg, 2010; & Lopata et al., 2010). Furthermore, college personnel may not be equipped with the training needed to fully

understand the complexities of these disorders (Graetz & Sampinato, 2008). Barnhill (2016) aimed to evaluate current support resources offered by universities for students with AS. A survey was designed to elicit information regarding participant demographic information and support services offered to these individuals; in addition to, a series of open-ended questions used to inquire whether the institution offered AS or ASD support groups, counseling services, housing accommodations, and planned supervised social activities. Analysis revealed that 19 (63%) of the 30 universities surveyed offered support resources specifically for students with AS and ASD. Participants reported that students with AS and ASD typically accessed the following accommodations: academic advisor support, extra time on exams, alternative testing site, tutoring, note taker, and technology support. In conclusion, successful post-secondary programs should provide comprehensive support resources to meet the unique and individualized needs of those students with AS and ASD.

2.2.2 Gastrointestinal Disorders

2.2.2.1 Irritable Bowel Syndrome

Irritable Bowel Syndrome (IBS) is characterized as a functional gastrointestinal disorder consisting of abdominal discomfort and disordered bowel movements (Lea, Hopkins, Hastleton, Houghton, & Whorwell, 2004; Emmanuel, Eamonn, & Quigley, 2013). Epidemiologic data suggest that IBS affects roughly 11% of the population globally, with a higher prevalence among females (Manning, Thompson, Heaton, & Morris, 1978; Drossman, Funch-Jenson, & Janssen, 1990; Lovell & Ford, 2012). IBS is commonly associated with a poor quality of life and negative impacts in both work and social settings (Canavan, West, & Card, 2014). Additionally, the condition is attributed to significant psychological distress and

psychiatric comorbidities such as anxiety, depression, and suicidal ideation (Canavan, West, & Card, 2014; Stasi, Bellini, Blandizzi, & Milani, 2014).

Hazlett-Stevens, Craske, Mayer, and Nailboff (2003) sought to determine the relationship between the presence of IBS and psychiatric disorders among a sample of college students. A total of 1,021 participants (331 males, 618 females, and 72 unspecified), recruited from three undergraduate psychology courses, completed the questionnaire. The questionnaire contained validated measures of IBS, GAD, chronic worry, neuroticism, anxiety sensitivity and visceral anxiety. Data revealed that IBS was identified in 79 participants. Based on the Rome II criteria, 30 IBS participants (41.7%) were diarrhea predominant, 25 (34.7%) were constipation predominant, and 17 (23.6%) did not meet the criteria for either IBS classification. The mean reported severity of symptoms for IBS participants was 2.62 on a 1-5 Likert scale (n = 47, ± 0.68), indicating mild to moderate symptom severity. Further, participants reported their most inconvenient IBS symptoms were irregular bowel habits such as diarrhea or constipation (38.3%), abdominal discomfort (23.4%), and early satiety (14.9%). A chi-square analysis yielded a statistically significant association between IBS and GAD (χ^2 (1) = 18.86, p < 0.001). In addition, comparisons between participants with and without IBS were conducted for Penn State Chronic Worry (PSWQ), neuroticism, anxiety sensitivity index (ASI), and visceral anxiety measures. Scores on all four measures were significantly higher among participants with IBS compared to the asymptomatic group [PSWQ: t (701) = 4.79, p < 0.001; neuroticism: t (397) = 3.68, p < 0.001; ASI: t (400) = 3.70, p < 0.001; Visceral Anxiety: t (51.15) = 4.76. p < 0.001]. These data indicate that various psychiatric disorders such as anxiety are related to IBS symptomology.

2.2.3 Learning Disorders

Postsecondary education has become more accessible over the past several decades, evidenced by increasing enrollment and graduation rates for the U.S. population (National Center for Education Statistics, 2006). However, the greatest change has been among the sub-population of students with disabilities, specifically those who possess a learning disorder (Gregg, 2007). The increase in college enrollment rates for students with disabilities can be attributed to the array of resources provided by universities. Such services may include assistive technologies, program modifications, assistance programs, and psychotherapy and counseling resources for students with disabilities (Rath & Royer, 2002).

Murray and Wren (2003) sought to determine cognitive, academic, and attitudinal predictors of college grade point averages among a sample of college students with learning disabilities (LD). Participants included students diagnosed with a LD receiving support services from on-campus resources. The final sample consisted of 84 participants; of these students, 56% were male and 44% were female. In addition to a self-reported measure of study habits and study attitudes, measures of cognitive and academic functioning were also used as predictor variables for GPA. An ANOVA was used to compare gender differences on predictor and outcome variables. The gender comparison for IQ was statistically significant, ($F_{(1,82)} = 4.2$, $p < 0.05$). This Indicated that males (mean = 104, ± 12.2) had higher IQ scores than females (mean = 98, ± 12.1). A stepwise regression identified IQ, study habits, and attitudes as positive predictors of GPA among students with learning disorders, ($F_{(4,79)} = 3.2$, $p < 0.05$).

2.2.4 Musculoskeletal Disorder

The prevalence of upper extremity musculoskeletal disorders is increasing and becoming a fast-growing source of workplace disability in the United States (Bernard, 1997). A main contributing factor to the rate of such disorders may be prolonged computer work. The association between these disorders and excessive technology use suggest that college students could be at an increased risk (Bureau of Labor Statistics, 2018).

Katz et al. (2000) investigated the prevalence of upper extremity musculoskeletal disorders in a sample of college seniors. Students (n = 1,601) were required to complete an exit survey in order to obtain graduation eligibility. The survey included the question "Do you experience pain, numbness, or tingling or other discomfort in your hands, wrists, or arms when you use a computer?" Other items on the survey used to predict possible determinants of upper extremity musculoskeletal symptomology included gender, academic major, residency, hours of computer use per week, and participation in athletics. Statistical analysis revealed that 720 (47%) students were asymptomatic, 630 (41%) reported symptoms after several hours of computer use, 106 (6.9%) reported symptoms after one hour or less of computer use, 49 (3.2%) reported symptoms after a few minutes of computer use, and 39 (2.5%) reported symptoms with all activities. Correlates of disorder symptoms included female gender (OR: 1.6, 95% CI: 1.3 to 1.9), computer science major (OR: 2.2, 95% CI: 1.1 to 4.3), and computing more than 20 hours per week (OR: 1.4, 95% CI: 1.1 – 1.9). These data suggest that more than half of college students sampled reported having upper extremity symptoms due to prolonged computer use.

2.2.5 Neurological Disorder

2.2.5.1 Attention Deficit Hyperactivity Disorder

As defined by the American Psychiatric Association, attention-deficit hyperactivity disorder (ADHD) is a chronic condition characterized by attention difficulty and increased hyperactivity-impulsivity that presents across an individuals' life span (American Psychiatric Association, 2000). Epidemiologic research has suggested that approximately 2 to 8% of the college population experiences clinically significant levels of ADHD symptoms and roughly 25% of college students with disabilities are diagnosed with ADHD (Wolf, Ollendick, & Bray, 2001). ADHD presents a multitude of challenges across several domains for the college student. Such challenges increase the difficulty in dealing with the demands associated with academics, social situations, and career planning which may lead to lower rates of academic success, as well as higher rates of college dropouts (Weyandt & DuPaul, 2006).

Students with specific disabilities such as ADHD may be at an increased risk for developing other mental health problems such as anxiety and depression (Maag & Reid, 2006; McGillivary, & Baker, 2009). Nelson and Gregg (2012) examined the prevalence of anxiety and depression among college students with ADHD, dyslexia, and/or comorbid ADHD/dyslexia. This study included three clinical groups consisting of participants diagnosed with ADHD (n = 60), dyslexia (n = 60), or comorbid ADHD/dyslexia (n= 30), as well as a nonclinical group that served as the control (n = 60). Of the 150 participating college students from the clinical groups, 14 were diagnosed with anxiety and/or mood disorder (n = 9 for anxiety, n = 4 for mood disorders, n = 1 for comorbid anxiety/mood disorder). All participants were required to complete a questionnaire that measured self-

reported symptoms of depression and anxiety. Findings from this study suggested no significant difference between college students with ADHD, dyslexia, or ADHD/dyslexia and self-reported symptoms of anxiety and depression when compared to each other.

Similarly, Weyandt et al. (2013) analyzed the differences in neuropsychological, academic, psychological, and social functioning among college students with ADHD and their non-disordered peers. Participants with ADHD (n = 24) and without ADHD (n = 26) were recruited from two universities in northeastern United States. Participants completed questionnaires that included the following topics: executive functioning, psychopathological symptomatology, academic performance, study/organizational skills, social adjustment, emotional expression, alcohol use, drug use, memory, and attention impulse control. An ANOVA analysis revealed that participants with ADHD demonstrated a significantly higher prevalence of obsessive-compulsive behaviors ($p < 0.001$), depression ($p < 0.002$), anxiety ($p < 0.001$), and hostility ($p < 0.001$). In terms of academic performance, participants with ADHD reported significantly lower grades on assignments compared to the control group. Data also revealed that students with ADHD reported significantly lower study and organizational skills compared to their non-disordered peers, $p < 0.01$. Lastly, data indicated statistically significant differences in the areas of executive functioning, emotional expression, and social adjustment.

Norwalk, Norvilitis, and Maclean (2009) aimed to determine the relationship between self-reported ADHD symptomatology and various correlates among a sample of undergraduate students. Students (N = 321) were recruited from an undergraduate level psychology class with an age range of 18 to 49 (mean age = 20.04, ± 4.33). The participants were asked to report their cumulative college grade point average which ranged from 1.31 to

4.0 ($\bar{x}$ = 3.06, ± 0.540). To assess ADHD symptomology, an altered version of the CAARS

was used, followed by a question asking participants to disclose if they had previously been

diagnosed with ADHD. Other variables measured included academic and social adjustment,

career decision making, study habits, academic performance, and depressive symptomology.

Regression analysis revealed a positive correlation between self-reported ADHD symptoms

and scores on the depression scale (r = .46, p < 0.001). Correlation analysis indicated a

significant negative correlation between scores on the ADHD Index and academic

adjustment (r = - 0.32, p < 0.001), social adjustment (r = - 0.15, p < 0.05), study habits (r = -

0.25, p < 0.001), and career decision making (r = - 0.027, p < 0.001). The relationship

between GPA and ADHD was found to be insignificant (r = - 0.10, p = 0.25). In conclusion,

this study found that among the sample population, ADHD symptomatology was associated

with factors related to academic and social adjustment, study habits, and grade point average.

2.2.5.2 Chronic Headache and Migraine Disorder

Headache disorders are characterized by a recurrent headache that is painful and

disabling (https://www.who.int/news-room/fact-sheets/detail/headache-disorders). Research

suggests that, among the adult population, an estimated 46% have a generalized headache

disorder, 11% have migraine headache, 42% have tension-type headache, and 3% have

chronic daily headache (Stovner et al., 2007). Those who suffer from headache disorders can

experience a poor quality of life due to the presence of physical and emotional limitations

and the associated negative effects on professional and academic endeavors (Souza-e-Silva &

Rocha-Filho, 2011).

Souza-e-Silva and Rocha-Filho (2011) aimed to approximate the one-year prevalence

of headaches and the associated repercussions on academic performance. Semi-structured

interviews were conducted using the Headache Impact Test (HIT-6) and the Hospital Anxiety and Depression Scale. Other variables such as academic performance and class attendance were obtained by examining students' academic records. Statistical analysis affirmed that the prevalence of headache was 87.2%, migraine prevalence was 48.5%, and tension-type headache prevalence was 42.4%. In the three-month period prior to the interview, 8.7% sought emergency services, 30.8% missed class, and 30.8% experienced a decline in productivity due to headaches. A multiple-linear regression indicated that serious impact headaches are significantly related to a greater incidence of depreciated academic performance and absenteeism ($p < 0.01$). These data suggest a high prevalence of headaches within the studied population of university students, as well as a high impact on quality of life and academic success.

Smitherman, McDermott, and Buchanan (2011) investigated the impact of migraine headaches among college students on quality of life, functional impairment, and comorbid psychiatric disorders. Three hundred and ninety-one university students (76.73% female, mean age = 19.43 ± 2.80 years) completed surveys that elicited information concerning migraine and migraine-related impairment, quality of life, and comorbid psychiatric symptoms. Of the 391 participants, 101(25.83%) met the criteria for episodic migraine. Participants' mean score on the Migraine Disability Assessment Questionnaire was 9.98 ± 12.10. In comparison to students not screening positive for migraine, the migraine positive group indicated reduced quality of life on 5 out of 6 domains, as well as an increased prevalence of missed school days (2.74 vs. 1.36), impaired functioning at home (2.84 vs 1.21 days), and medical visits (1.86 vs 0.95). Migraine-positive participants also reported significantly more symptoms of both anxiety and depression compared to the control group

(p < 0.001). In conclusion, these data indicate that migraine headache is related to numerous negative consequences among university students, including comorbid psychiatric conditions.

2.2.6 Psychiatric Disorders

Mental health among college students represents a growing public health concern, as data suggests that the rate of mental illness is increasing in number and severity (American College Health Association, 2008; Gallagher, 2008). A comparison of trend data indicates a particular increase in anxiety and depression since the 1980's (Hidaka, 2012). Currently, psychiatric disorders account for roughly one-half of the disease burden among young adults with causative factors encompassing genetic, environmental, and/or lifestyle circumstances (https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health).

College represents a challenging transitional period where an untreated mental illness may inhibit students from being successful in academic, work, and social settings (Kessler, Foster, Saunders, et al., 1995; Kessler, Walters, & Forthofer, 1998). The literature has suggested that within the college population, specific subgroups may have a higher prevalence of mental illness. For instance, male students, are at a higher risk of having suicidal ideation, where female students are more likely to be diagnosed with severe anxiety and depression (Eisenberg, Gollust, Golberstein, & Hefner, 2007). Students from lower socioeconomic backgrounds, those with relationship stressors, limited social support, or victimization by sexual assault are also at an increased risk of severe anxiety and depression (Stepakoff, 1998; Kisch, Leino, & Silverman, 2005; Eisenberg, Gollust, Golberstein, & Hefner, 2007).

Blanco et al. (2008) aimed to assess the prevalence of psychiatric disorders, sociodemographic correlates, and rates of treatment among U.S. college students and their non-college attending peers. Data collected from face-to-face interviews conducted during the 2001-2002 National Epidemiological Survey on Alcohol and Related Conditions (N = 43,093) were used. Statistical analyses were performed for the sample of college-age individuals who were both attending (n = 2,188) and non-attending (n = 2,904) a college or university in the previous year. Data revealed that roughly one-half of the college-aged participants (45.79%) experienced symptoms related to a psychiatric disorder, with the most prevalent disorders being alcohol use disorders (20.37%), followed by personality disorders (17.68%). The study found no significant difference in the overall prevalence of psychiatric disorders between college-attending individuals and their non-attending peers. In addition, the risk of alcohol use disorders was significantly greater for the college-attending participants compared to their non-attending peers (OR = 1.25; 95% CI, 1.04-1.50). Further, college students were significantly less likely to have a diagnosis of a drug use disorder or nicotine dependence than their non-attending peers. In conclusion, this study determined a high prevalence of psychiatric disorders, specifically alcohol use disorders, among the college-aged population and that treatment rates among both college attending and non-attending participants was low.

Zivin, Eisenberg, Gollust, and Golberstein (2009) conducted a survey study among a randomized sample of college students, with the objective of bettering the understanding of the factors related to the longitudinal course of mental health disorders and treatment. This study examined the persistence of an individuals' mental health disorder over a two-year period and the persistence and change of an individuals' help-seeking behavior (use of

psychotherapy and medication). A baseline online-survey was administered to students attending a university during the fall of 2005 and a follow-up survey in the fall of 2007. Screening instruments were used to measure symptoms of common psychiatric disorders (i.e., anxiety, depression, eating disorders, self-injury, and suicidal ideation). The persistence of common mental health disorders, as well as students' need for mental health services (medication or therapy) was measured between the two time periods. The final sample size consisted of 763 students (47% male, 52% female) between the ages of 18 and 31. Statistical analysis revealed that more than one-third of participants had a mental health problem, with the highest prevalence being eating disorders (18-19%), followed by depression (13-15%). Sixty percent of participants who had a mental health disorder in 2005 still had a disorder in 2007. In addition, 25% of participants who did not have a problem in 2005 developed one by 2007. Data also revealed that, of the study sample, 270 participants perceived a need for mental health services and utilized services during the duration of the study. These data suggest that mental disorders are prevalent and persistent among the college student population.

Given the enormous stress that is associated with college, ranging from academic demands to interpersonal stressors, the mechanisms students use to cope with such stressors may serve as a notable factor in determining interventions for mental illness (Eisenberg, Gollust, Golberstein, & Hefner, 2007; Aldao, Nolen-Hoeksema, & Schweizer, 2010). Coiro, Bettis, and Compas (2017) aimed to assess the associations between interpersonal stress, coping strategies, and related symptoms among a sample of undergraduate students. A total of 135 students from two universities submitted responses to the Patient Health Questionnaire (Spitzer, Kroenke, & Williams, 1999), a self-diagnostic tool for mental health

disorders. Students also submitted responses to the Responses to Stress Questionnaire (RSQ) that was used to assess coping strategies (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). For this study, primary control coping refers to efforts to change a stressor directly or directly changing ones' emotional response, while secondary coping includes the efforts to adapt to a particular stressor and ultimately accept the stressor (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). Data revealed that students mainly relied on secondary coping strategies such as problem solving to manage interpersonal stress. Additionally, interpersonal stress levels were significantly correlated with students' self-reported symptoms of depression, anxiety, and somatization, all $p < 0.001$. The association between interpersonal stress and depression was significantly decreased when primary and secondary control coping were added to the model, $p < 0.001$.

2.2.6.1 Drug Abuse

Studies have shown that polysubstance abuse and associated dependence are more common among college-aged individuals compared to other populations (Johnston, O'Malley, Bachman, & Schulenberg, 2004; Kaloyanides, McCabe, Cranford, & Teter, 2007). Some students may enter college with previous experiences with illicit drugs, while others initiate substance use during college (Arria et al., 2017). More specifically, research has indicated that one-third of students have used marijuana prior to college (Pinchevsky et al.,2012; Stewart & Moreno, 2013; Suerken et al., 2014). Such students are at an increased risk of becoming regular users of marijuana and are more likely to use other illicit drugs during college (Mohler-Kuo, Lee, & Wechsler, 2003). Undergraduate students are more susceptible to either continuing or initiating drug use due to the perceptions that illicit drugs are easily accessible and widespread in college populations, students are not under direct

supervision of an authority figure, and the low perceived risk of drug use among young adults (Kilmer et al., 2006; Martens et al., 2006; Arria et al., 2008; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2015). Lastly, the consequential effects related to substance abuse are well-documented and include higher rates of death and injury, sexual assault, suicide, and poorer academic outcomes (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008; Benotsch et al., 2014; Taylor, El-Sabawi, & Cangin, 2016).

Arria et al. (2017) aimed to estimate the annual and lifetime prevalence of drug use among college students. Participants (N = 1,253) included young adults who were originally enrolled as first-time, first year students at a U.S. university. Structured interviews were used to elicit information about the use of seven illicit drugs and the nonmedical use of three prescription drugs. Findings suggested that marijuana was the most commonly used drug during every year of the study. Nonmedical use of prescription drugs such as stimulants, analgesics, and tranquilizers were more prevalent during college than in the later years of the study. The current findings suggest that drug use is prevalent among college students and persists into the post-college period.

Prescription stimulants such as amphetamines (i.e., Adderall), dextroamphetamines (i.e., Dexedrine), and methylphenidates (i.e., Ritalin and Concerta) are frequently prescribed medications for the treatment of attention-deficit hyperactivity disorder (ADHD) (Cruz, Sumstine, Mendez, Bavarian, 2017). The increasing prevalence of ADHD among college students has heightened the on-campus availability of such prescription drugs. The increased availability of these medications has resulted in an increase of illicit use of prescription stimulants among students. Data from a 2015 national study suggested that 10.7% of college students used Adderall for non-medical reasons (Miech, Johnston, O'Malley, Bachman, &

Schulenberg, 2016). The motivations for the nonmedical use of prescription stimulants may include the enhancement of cognitive skills and recreational benefits (Burgard, Fuller, Becker, Ferrell, Dinglasan-Panlilio, 2013). The concern for misuse of prescription stimulants is related to the wide array of adverse psychological and physiological effects, including abuse, addiction, dependence, psychosis, seizures, cardiovascular events, and death (Lakhan & Kirchgessner, 2012).

McCabe, Teter, Boyd, Knight, and Wechsler (2005) aimed to examine the prevalence and correlates of the non-medical use of prescription stimulants (i.e., Ritalin, Dexedrine or Adderall) among a sample of U.S. college students. The study design used data from the 2001 College Alcohol Study survey of 119 U.S. universities. Participants (N = 10,904) self-reported use of non-medical prescription stimulants and other substance use behaviors. Findings suggested that the life-time prevalence of non-medical prescription stimulant use was 6.9% (SE = 0.005). Multivariate analysis revealed a significant difference among student characteristics such as race/ethnicity (p < 0.001), living arrangement (p < 0.005), and grade point average (p < 0.001). Data also revealed a positive correlation between the rate of non-medical use of prescription stimulants and marijuana use in the past year, (r = 0.55, p < 0.001). In addition, a positive correlation between rate of non-medical use of prescription stimulants and binge drinking was found, (r = 0.52, p < 0.001). The findings from this study suggest that non-medical use of prescription stimulants is more prevalent among specific subgroups of U.S. college students.

In a similar study, Cruz, Sumstine, Mendez, and Bavarian (2017) examined racial/ethnic and gender differences in characteristics of prescription stimulant misuse (i.e., routes of administration, sources of prescription stimulants, costs, motivation of use, and

experiences with illicit use) among a sample of college students attending two universities in California. A total of 1,053 participants (n = 554 from campus 1, n = 499 from campus 2) completed a version of the Behavior, Expectancies, Attitudes, and College Health Questionnaire. The sample demographics included 58.69% females, 28.13% Caucasian, and 31.05% Asian. The age range of the sample was 18 to 67 years, with a mean age of 22.8 years. Chi-square analyses were conducted to examine differences in characteristics of illicit use of prescription stimulants by race/ethnicity and gender. Data revealed a statistically significant association between race/ethnicity and motivation of use such as, improving focus ($p < 0.05$) and staying awake ($p < 0.01$). Being Asian, versus being Caucasian, decreased the odds of having the motive to use drugs to improve focus (OR = 0.30, 95% CI 0.14-0.67, $p < 0.05$). In addition, Asians were less likely to have the motive to use drugs to stay awake compared to Caucasians (OR = 0.33, 95% CI 0.15-0.70, $p < 0.01$). Lastly, being male, versus being female, significantly decreased the odds of using drugs to lose weight (OR = 0.21, 95% CI 0.06-0.76, $p < 0.05$).

The literature has consistently reported that stimulant misuse is significantly correlated with body image issues and disordered eating patterns among the college population (Jeffers, Benostch, Koester, 2013). This can be attributed to the appetite suppressant effect that can occur with stimulant use. Patients with eating disorders who exhibit bulimic symptoms (i.e., binge eating episodes and vomiting) have been found to be at an increased risk of using prescription stimulants for non-medical purposes (Root, Pinherio, Thornton, et al., 2010). Few studies have analyzed the relationship of ADHD-stimulant misuse and eating disorder psychopathology among the college population. Gibbs et al. (2016) examined the misuse of ADHD stimulants in a sample of college-age women at risk

for or with a clinical eating disorder. Between the months of September 2009 and June 2010, five hundred forty-nine women were recruited for the study via email or social interaction. The sample population consisted of participants at low risk for an eating disorder (n = 96), at high risk for an eating disorder (n = 346), or with a clinical or subclinical eating disorder (n = 107). The sample consisted of women between the ages of 18 and 25 of whom had a body mass index between 18 and 32 kg/m^2. The participants completed assessment questionnaires that elicited information concerning stimulant misuse and eating disorder-related psychopathology. Statistical analysis indicated that 47 students (10.5%) reported non-medical use of ADHD-specific stimulants. Of these 47 students, 8 (17.0%) reported using prescription stimulants for the purpose of weight control. Data affirmed that participants with a clinical or subclinical eating disorder diagnosis were significantly more likely to report non-medical stimulant misuse (20.8%) in comparison to participants at a high risk for an eating disorder (7.3%) (χ^2 (1) = 15.58, p < 0.001). Furthermore, binge eating, excessive exercise, and dietary restraint were not associated with ADHD-specific stimulant misuse. These data yielded a correlation between stimulant misuse and eating disorder pathology among the sample of undergraduate college women.

Recent research has quantified the non-medical use of prescription drugs i.e., pain relievers, stimulants, and tranquilizers on college campuses (McCabe and Teter, 2007; McCabe, 2008; Garnier-Dykstra et al., 2012). It was found that college students frequently use pain relievers, including hydrocodone products like Vicodin and codeine and oxycodone products such as OxyContin and Percodan. Among this population, stimulants were most commonly used to enhance cognitive function while tranquilizers were often used to

intensify the high of other drugs or counteract the unfavorable side effects (O'Brian, 2005; Wu et al., 2008; Garnier-Dykstra et al., 2012; Burgard et al., 2013; Hanson et al., 2013).

Brandt, Taverna, and Hallock (2014) examined the prevalence of lifetime non-medical prescription drug use and related correlates such as motivation for illicit drug use and the perceived emotional and physical risk among students at a small Northeast university. A total of 303 students completed an online-administered survey which elicited information regarding non-medical use of prescription pain relievers, stimulants, and anti-anxiety medication. Participants were also asked to reveal the source of these drugs if not obtained by a current prescription. Findings suggest a 36.8% prevalence of prescription drug use for non-medical reasons among the sample of college students. Of those reporting drug use, 48% reported non-medical use of pain-relievers, 72.8% reported using stimulants, and 39.8% reported using anti-anxiety medications. The most commonly used pain relievers were Vicodin, OxyContin, and Codeine. The most commonly used stimulants were Adderall and Ritalin, while the most commonly used tranquilizer was Xanax. Non-drug users reported that the factors that affected their decision to not abuse prescription drugs was lack of interest (82%), fear of damaging their physical health (61%), and fear of damaging their mental health (60.1%). Chi square analysis revealed a statistically significant difference among users and non-users in the extent to which they perceived pain reliever use as harmful to one's mental health ($p < 0.01$), physical health ($p < 0.05$), and whether they are addictive in nature ($p < 0.01$). Findings indicated that there is a widespread use of non-medical prescription drugs, in particular stimulants, among this sample of college students.

In both acute and chronic conditions, prescription opioid analgesics are an effective option for pain management (Savage, 2003). However, despite the medical importance of

prescription opioids, there is an increasing concern related to the high misuse potential of these medications (Zacny et al., 2003). Current research found that 1 in every 10 Americans between the ages of 18 and 25 report a nonmedical use of opioids (Johnson, O'Malley, Bachman, 2003). Data regarding the prevalence of nonmedical opioid use among college students remains limited, compared to what is known about the misuse of other substances such as alcohol.

McCabe, Teter, Boyd, Knight, and Wechsler (2004) aimed to examine the prevalence and related correlates of nonmedical use of prescription opioid analgesics among U.S. college students. This study used data from a nationally representative sample (n = 10,904) of randomly selected college students. The survey design elicited information in regard to the nonmedical use of prescription opioid analgesics, as well as other substance use behaviors such as cigarette use, alcohol use, and illicit drug use. Statistical analysis revealed that approximately 12% of the sample reported a lifetime nonmedical use of prescription opioid analgesics, 7% reported nonmedical use in the past year, and 3% reported nonmedical use in the past months. A multivariate logistic regression found that nonmedical use of prescription opioids was significantly higher among college students who were Caucasian ($p < 0.001$), off-campus residents ($p < 0.001$), and students with a lower grade point average ($p < 0.001$). These students also reported higher rates of substance use and other high-risk behaviors. These data suggest that the nonmedical use of opioid analgesics is a reason for concern on U.S. college campuses.

2.2.6.2 Alcohol Abuse

College drinking presents as a significant health concern as the associated ramifications threaten a students' social and intellectual wellbeing. Although a large majority of college students are known to have experiences with alcohol prior to entering college, alcohol misuse remains rampant. Alcohol misuse during college may be the result of several aspects of the college lifestyle such as unstructured time, the availability of alcohol, and limited interaction with an authoritative figure (SAMHSA, 2017). The misuse of alcohol may lead to comorbidities such as suicidal ideation, health disparities, and self-injury (Brennan, Walfish, & AuBuchon, 1986; Kushner & Sher, 1993; Nelson, Kocos, Lytle, & Perry, 2009).

Sultske (2005) compared the prevalence of alcohol use disorders and related symptoms among a sample of college students to their non-college-attending peers. Data were obtained from the 2001 National Household Survey. Participants aged 19 to 21 years (mean age = 20, SE = 0.02) who had completed the survey, as well as indicated to be either a full-time or part-time college student (n = 3184, 51%) were included in the analysis. Structured interviews were used to elicit information regarding participant alcohol involvement and alcohol use disorders. Seven different variables related to frequency of alcohol use were examined: lifetime, past-year and past-month use of any alcohol, past-year and past-month drinking at least once a week (on average), past-month binge drinking at least once a week (on average), and past-month daily drinking. A diagnosis of alcohol abuse required at least 3 to 7 alcohol dependence symptoms that occurred in the previous year. Among the entire study sample, the estimates of DSM-IV alcohol dependence or abuse was 16.6%, 22.5% among males, and 11.0% among females. These data indicate a minimally changed prevalence among the 18 to 29-year-old participants in the 1991 to 2002 National

Longitudinal Alcohol Epidemiological Survey (16.2% overall, 22.4 among males, and 10.1%

among females) (Grant et al., 2004). Statistical analysis revealed that 18% of U.S. college

students (24% of males, 13% of females) experienced clinically significant alcohol-related

problems within the previous year in comparison to 15% of their non-college attending peers

(22% of males, 9% of females; overall OR: 1.32). There was a positive association between

past-year alcohol use disorders and college attendance among females (OR: 1.70) compared

to males (OR: 1.14). In addition, college students were significantly more likely to receive a

diagnosis of DSM-IV alcohol abuse than their non-college-attending peers (p < .001). In

conclusion, the consequential effects of heavy binge drinking among the college student

population are considered to be clinically significant. However, the college population does

not seem to be at a greater risk for alcohol dependence when compared to their non-college-

attending peers.

Research has identified collegiate athletes as a vulnerable population more likely to

participate in binge drinking practices compared to those who are not members of an athletic

team (Nelson & Wechsler, 2001; Wilson, Pritchard, & Schaffer, 2004). Ford (2007)

investigated alcohol use among undergraduate college students, concentrating on the

difference in binge drinking based on participation in athletics. Data were obtained from the

Harvard School of Health College Alcohol study, which included approximately 14,000

students from both private and public institutions (Wechsler, 1999). A Chi-square analysis

was conducted to determine the relationship between athletic status and binge drinking

behavior among the study sample. Findings suggested that college students involved in

athletics are more likely to binge drink compared to the participants who were not athletes

(52.4% to 42.6%). Regression model data indicated that college students who are involved in

athletics are significantly more likely to report binge drinking (OR: 1.278, p < 0.001).

Variables such as male gender, Caucasian and Hispanic ethnicity, younger age, never

married, Greek affiliation, lower grade point average, and past history of alcohol misuse were

considered to be significant predictors of alcohol use among this population (p < 0.001).

These findings suggest that undergraduate college students involved in college athletics are at

an increased risk of developing binge drinking behaviors compared to non-athletes.

A qualitative research study hypothesized that alcohol consumption may be directly

correlated with weight-related behaviors among college students (Nelson, Kocos, Lytle, &

Perry, 2009). Nelson, Lust, Story, & Ehlinger (2009) investigated the association between

weight-related behaviors and binge drinking and alcohol-related eating among college

students attending the University of Minnesota. A survey was administered to a non-

probability sample of enrolled university students. Out of the 6,000 surveys distributed, 3,206

were completed and returned. The survey consisted of assessment tools that measured

alcohol consumption, weight status, diet, activity, and sociodemographics. Statistical analysis

affirmed that binge drinking was associated with adverse behaviors such as infrequent

breakfast consumption, fruit/vegetable intake, high fast food consumption, unhealthy weight

control behaviors, body dissatisfaction (95% CI: 1.08-1.26), and sedentary behavior (95%

CI: 1.06-1.39). A significant interaction between gender and binge drinking on dietary

patterns was found (p ≤ 0.01). Findings also suggest that female participants, compared to

males, were less likely to engage in alcohol-related eating behaviors if they were attempting

to lose weight. In conclusion, binge drinking was found to be associated with a range of

adverse behaviors.

Social anxiety is considered to be a common motivator for frequent alcohol use among college students (Burke & Stephens, 1999). The onset of a social anxiety disorder precedes the onset of alcohol problems, signifying that social anxiety may be a potential risk factor for alcohol abuse and dependence (Davidson, Hughes, George, & Blazer, 1993). Findings from a past study found that students with a self-reported drinking problem also reported higher social anxiety symptoms in comparison to their peers without a drinking related problem (Lewis & O'Neill, 2000).

Geisner, Larimer, and Neighbors (2004) evaluated the prevalence of symptoms of psychological distress and the relationship between such symptoms and alcohol use. Participants were randomly selected from three public universities. The final study sample consisted of 1,705 undergraduate students (1,181 females and 524 males) with a mean age of 22.03 ($\pm$ 5.79). The study used three validated instruments to measure alcohol use, alcohol consequences, and psychological distress symptoms. Data revealed that males reported significantly greater weekly alcohol consumption (5.99 standard drinks per week) compared to females (3.56 standard drinks per week) (t [1661] = 9.06, $p < 0.001$). In addition, participants that scored higher in psychological distress also reported greater alcohol consumption (t [1661] = 6.28, $p < 0.0001$). Also, the relationship between psychological distress and alcohol consumption was stronger for males (t [1661] = 2.17, $p < 0.05$). Univariate analysis indicated that males reported experiencing more negative consequences from excessive alcohol consumption than females (t [1698] = 3.74, $p < .001$). Lastly, data indicated that participants with higher levels of psychological distress reported more alcohol-related problems (t [1698] = 14.46, $p < 0.0001$). These findings suggest that the negative

consequences of alcohol use, in addition to frequency of alcohol use, may aid in identifying

students who are at an increased risk for comorbid psychological distress.

Similarly, studies have analyzed the associated risk of alcohol abuse or dependence

on the development of anxiety and mood disorders (Melchert & Banken, 1999; Verheul et

al., 2000). A recent study of the U.S. population found that those with an alcohol use disorder

were at a 2.6 and 1.7 times higher risk of developing a mood or anxiety disorder, respectively

(Grant et al., 2004). Dawson, Grant, Stinson, and Chou (2005) aimed to examine the

association between drinking experiences and the prevalence of anxiety, mood, and

personality disorders using participants (n = 43,093) from the 2001-2002 National

Epidemiologic Survey on Alcohol and Related Conditions. The prevalence of

psychopathology and associated drinking frequency was compared for college students 18-29

years of age, other youth 18-29 years of age, and adults 30 years of age and older. Data

revealed that participants with alcohol dependence experienced an increased risk of

developing a mood or anxiety disorder among the college student sub-population (OR: 2.4, p

< 0.01). Among the participants 30 years of age and older, the increase risk of

psychopathology was higher than the risk associated with college students (OR: 1.5-3.8). No

significant differences were observed among college students in relation to psychopathology

and alcohol frequency.

Depressive symptomology often co-occurs with alcohol misuse, in particular during

the young adulthood years (Arnett, 2005). Drinking to cope links psychological distress with

subsequent alcohol abuse and related consequences among the college-aged population

(Bravo, Pearson, Stevens, & Henson, 2016). Kenney, Anderson, and Stein (2018) compared

the role of coping strategies in the relationship between depressive symptoms and drinking

problems in college and non-college adult subgroups. Three hundred forty-one participants were recruited for the study between the ages of 18-25 years. Structured interviews were used to obtain information regarding participant demographics, parental history of alcohol problems, depressive symptoms, drinking motives, alcohol consumption, and alcohol-related problems. Statistical analysis indicated that 139 participants (40.8%) were classified as having no depressive symptoms, 119 (34.9%) as having minimal symptoms, 48 (14.1%) as mildly depressed, and 9 (2.6%) as severely depressed. Among college-attending participants, depression was significantly associated with the use of alcohol for coping (b = 0.045, 95% CI: 0.025, p < 0.01). In addition, both students and non-students, use of alcohol for coping purposes were significantly associated with use of alcohol for enhancement and social reasons. Data revealed that drinking to cope was correlated to depression and alcohol misuse among students, but not for non-students.

2.2.6.3 Depression

Depression is classified as a multi-problematic disorder that leads to a decline in inter-personal, social, and occupational functioning (Sadock & Kaplan, 2007). Loss of positive affect is the diagnostic characteristic of depression which can evolve into a range of symptoms such as irregular sleep patterns, lack of self-care, decreased concentration, anxiety, and social detachment (NICE, 2009). Evidence suggests that the prevalence of depression is most common among college students (Vredenburg, O'Brien, & Krames, 1988). The range for onset of depressive symptoms is between 15-19 years of age with an estimated prevalence of 15% in the college student population (Young, Fang, & Zisook, 2010).
The factors that increase a students' vulnerability to depression include alterations in lifestyle behaviors that result in disturbed eating and sleep patterns, financial burdens, family/social

relationships, and academic hardships (NIMH, 2003). The literature also suggests a link between poor academic performance, unstable relationships, suicidal ideation and attempts, as well as a depreciated work ethic (Whitton & Whisman, 2010; Harvey et al., 2011; Hysenbegasi, Hass, & Rowland, 2005; Jeon, 2011).

Young, Fang, and Zisook (2010) conducted a comparative study analyzing the severity of depression in Asian-American and Caucasian undergraduate students attending the University of California, San Diego. Participants (N = 1,837) in the study completed a 9-item Patient Health Questionnaire and provided demographic information. The sample consisted of 1,251 Asian-American (869 female, 382 male) and 586 Caucasian (410 female, 176 male) students with a mean age of 20.32 (SD = 1.93 years). ANOVA analysis revealed that, compared to Caucasians, Asian-Americans portrayed significantly higher levels of depression, $(F (1,1764) = 10.340, p = 0.001)$, and in general, female students were significantly more depressed than males, $(F (1, 1764) = 11.013, p = 0.001)$.

Self-esteem is defined as an individuals' self-perceived worth and value (Rosenberg, 1965). Clinical literature has theorized that self-esteem plays a vital role in the etiology of depression (Beck, 1967; Blatt & Schichman, 1983). Beck's cognitive model of depression fueled research pertaining to self-esteem and negative affect. According to this cognitive theory, a low self-esteem may predispose an individual to negative affect due to the increased likelihood of a negative belief about the self and the world (Beck, 1967). Sargent, Crocker, and Luhtanen (2006) studied the relationship between self-worth and vulnerability to depressive symptoms among a sample of college freshman. The study sample consisted of 795 participants (343 males and 451 females) ranging in age from 16 to 22 years ($\bar{X}= 17.78$, ± 0.66). Questionnaire items were designed to elicit information regarding participant

sources of self-esteem, depressive symptomology, and how participants described themselves in favorable terms. ANOVA analysis yielded a significant main effect time, (F (1, 67) = 74.90, p < 0.001), with depressive symptoms increasing over the first semester of college due to external contingencies of self-worth (i.e., approval from others, appearance, competition, academics). Lastly, internal contingencies of self-worth (i.e., God's love, virtue) were not associated with depressive symptoms. These data suggest that external contributors of self-worth may increase an individuals' vulnerability to depressive symptoms.

2.2.6.4 Eating Disorders

Eating disorders are a serious illness that cause disruptions to an individuals' eating behaviors (https://www.nimh.nih.gov/health/topics/eating-disorders/index.shtml). Such disorders are categorized into diagnostic categories of anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS) (Bulik, Trace, & Mazzeo, 2013). The criterion for the diagnosis of AN may include weight loss, body image disturbances, amenorrhea, and impulsive behaviors (Casper, Eckert, Halmi, Goldberg, & Davis, 1980; Garfinkel, Moldofsky, & Garner; 1980; Maj, 2003). Whereas the criterion for the diagnosis of BN include the self-perception of being overweight, binge eating, and purging and non-purging behaviors (Fairburn, 1987; Garfinkel, Glodbloom, & Olmsted, 1992; Hay & Fairburn, 1998; Maj, 2003). Behaviors associated with eating disorders are found to be common among college students, with an increased prevalence among females (Hoerr, Bokram, Lugo, Bivins, & Keast, 2002; Prouty, Protinsky, & Canady, 2002). Risk factors associated with eating disorders include body dissatisfaction, low self-esteem, and depression/negative affect. Researchers have also proposed that social and academic stressors

associated with the college setting can increase a students' risk for developing a disordered eating pattern (Compas, Wagner, Slavin, & Vannatta, 1986).

Eisenberg, Nicklett, Roeder, and Kirz (2011) examined the prevalence, related correlates, and treatment-seeking behaviors of eating disorders (ED) in a non-probability sample of undergraduate and graduate students attending a Midwestern university. Participants (2,495 undergraduate students and 2,526 graduate students) were asked to complete an online-administered survey during the fall of 2005, in addition to a follow-up survey during the fall of 2007. The survey elicited information in regard to eating disorder symptoms and related correlates such as sociodemographic characteristics, including race/ethnicity, gender, and academic standing; health behaviors (i.e., self-injury, substance use, and exercise); and several measures of mental health. The symptoms of eating disorders were measured using the SCOFF screening instrument, a 5-item questionnaire designed to identify individuals at risk for developing an eating disorder (Morgan, Reid, & Lacey, 1999). Data from the SCOFF questionnaire indicated that 13.5% of undergraduate females, 9.3% of graduate females, 3.6% of undergraduate males, and 3.1% of graduate males were at an increased risk for developing an eating disorder. Among the student participants, 4% of females and 0.2% of males reported ever receiving an eating disorder diagnosis, indicating a significant difference by gender, (χ^2 [1, n = 2822] = 52.4, p < 0.001). Results also indicated that a positive screen for an eating disorder was related to mental health and health-related behaviors. Further, a positive screen for an eating disorder was significantly associated with an increased risk of major depression (both genders, χ^2 [1, n = 2822] = 21.6, p < 0.001), panic disorder (males only, χ^2 [1, n =1332] = 11.4, p < 0.001), generalized anxiety disorder (both genders, (χ^2 [1, n=2822] = 5.84, p = 0.012), and suicidal thoughts (both genders, χ^2 [1,

n = 2812] = 9.16, p = 0.011). In addition, analysis also revealed several health-related behaviors that were positively associated with ED symptoms such as self-injury (both genders, χ^2 [1, n = 2781] = 19.0, p = 0.001), binge drinking (females only, χ^2 [1, n = 1480] = 8.54, p < 0.001), cigarette smoking (both genders, χ^2 [1, n = 2798] = 14.4, p < 0.001), and marijuana use (females only, χ^2 [1, n =1479] = 5.67, p = 0.034). Furthermore, excessive exercise was positively correlated with eating disorder symptoms among females (χ^2 [1, n = 1484] = 4.47, p = 0.061) and negatively associated among males (χ^2 [1, n = 1328] = 5.24, p = 0.035). These data suggest that eating disorder symptoms were prevalent among this sample of college students.

Berg, Frazier, and Sherr (2009) investigated changes in eating disorder behaviors over time, assessed alterations in risk factors for eating disorder behaviors over time, assessed the relationship among changes in risk factors, and changes in eating disorder attitudes and behaviors. Independent samples t-tests were used to compare the subgroups of students (n = 186) who returned both Time 1 and Time 2 questionnaires. Because the aim of this study was to determine the change over time, only students who completed both questionnaires were included in the statistical analyses. A large majority of participating students were freshman (53%), followed by sophomores (23%), juniors (9%), and seniors (12%). The Eating Disorder Inventory-2 questionnaire was used in measuring psychological and behavioral symptoms associated with Anorexia Nervosa or Bulimia Nervosa. The questionnaire included a 7-item Bulimia subscale used to assess eating-disordered attitudes, in addition to a Social Insecurity subscale, Ineffectiveness scale, and 9-item Body Dissatisfaction subscale. The Eating Disorder Diagnostic Scale was implemented to assess symptoms related to Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder. The

study also included a depression scale that elicited information in regard to the cognitive, behavioral, and interpersonal aspects of depression, as well as an academic stress scale where students rated how stressful academic matters have been for them in the previous two weeks. Data revealed that between 2% (used laxatives/diuretics) and 30% (excessive exercise) of participants reported in engaging in eating disorder behaviors at Time 1. At Time 2, between 4% (laxatives/diuretics) and 22% (excessive exercise) engaged in these same behaviors. At Time 1, 49% of participants indicated at least one eating disorder symptom, compared to 40% at Time 2. In addition, a significant decrease in four of the five analyzed risk factors (i.e., academic stress, depression, feelings of ineffectiveness, and social insecurity) from Time 1 to Time 2 was found. In conclusion, a notable research finding suggests that, for most undergraduate women, eating disorder behavior and attitudes remained stable over time.

The literature on eating disorders primarily focuses on Caucasian, middle class women, excluding ethnically and economically diverse women and men (Cachelin, Rebeck, Veisel, & Striegel-Moore, 2001; Wilfley, Pike, Dohm, Streigel-Moore, & Fairburn, 2001). Gentile, Raghavan, Rajah, and Gates (2007) examined eating disorders in ethnically diverse, low-income, urban, undergraduate students. Data from this study were obtained in the first phase of a larger study examining risk factors for relationship violence in a low income and ethnically diverse group of undergraduate students. Eating disorder symptoms were measured using the 22-item Eating Disorder Diagnostic Scale (EDDS; Stice & Telch, 2000). The total sample included 884 undergraduate students with 56.0% identifying as female. A Chi-square analysis indicated that females (12.2%), compared to males (7.3%), were more likely to experience eating disorder symptoms, (χ^2 (1, n = 853) = 5.12, p = 0.023), and more likely to be diagnosed with a full-threshold eating disorder, (χ^2 (1, n = 853) = 4.77, p =

57

0.028), compared to males. In addition, females (8.9%), compared to males (4.6%), were more likely to have Bulimia Nervosa, (χ^2(1, n = 853) = 5.76, p = 0.020). In contrast, females (1.9%) and males (2.7%) were equally likely to report binge eating behaviors. In this sample of undergraduate students, findings indicated that 10% of the total sample, 12.2% of females and 7.3% of males, received a clinical eating disorder diagnosis. Further, of the women with an eating disorder, the majority were Latina with Caucasian women making up the smallest percentage. The results from this study indicate that, among the study sample, the prevalence of eating disorders among women were well above the national average for the general population.

As reported by the *Diagnostic and Statistical Manual of Mental Disorders,* for every 10 individuals who have a diagnosis of Anorexia Nervosa or Bulimia, 9 are female and 1 is male. The literature states that men who struggle with disordered eating or have an eating disorder diagnosis exhibit eating-related behaviors and attitudes that are comparable to those of women (Olivardia, Pope, Mangweth, & Hudson, 1995; Woodside et al., 2001; O'Connor, Simmons, & Cooper, 2003). Furthermore, data indicates that men are less concerned with losing weight; rather, men strive to become more muscular as compared to women who present eating disorder symptoms (Anderson & Holman, 1997; McCreary & Sasse, 2000; Lewinsohn, Seely, Moerk, Striegel-Moore, 2002).

Ousley, Cordero, and White (2008) conducted a comparative study that analyzed the difference in the associated patterns of eating disorders and body dissatisfaction among undergraduate men and women. A random sample of female (n = 750) and male (n = 750) undergraduate students attending a public university in southern California were asked to complete a version of the 2002 Weight Management, Eating and Exercise Habits Survey. A

total of 272 out of the 1,500 recruited students returned completed surveys. Of the students in the final sample, 70% were women and 30% were men, with an average age of 20.9 years. Participants self-reported their weight and height in order to compute the body mass index (BMI). The average BMI of the sample was 22.6 kg/m^2 with 75% of respondents falling within the normal BMI range of 18.5 to 24.9 kg/m^2. Data comparing men with eating disorders to men without a diagnosis revealed a significant difference between these groups in terms of how often they felt fat and how fearful they were at becoming untoned ($p < 0.05$). Data suggests that undergraduate men with an eating disorder are preoccupied with muscle tone, but not necessarily with losing weight.

Disordered eating patterns, specifically binge eating and purging behaviors, are correlated with alcohol and drug misuse, as disordered eaters are more likely to abuse non-prescription stimulant drugs, given their appetite suppressant side effects (Herzog et al., 2006; Jeffers & Benotsch, 2014). Ward, Oswald, and Galante (2016) aimed to test the hypothesis that college students that engage in disordered eating patterns, such as calorie restriction or excessive exercise, would be at an increased risk for alcohol and prescription stimulant misuse. The study sample included 379 college students (273 females, 106 males) attending a Midwestern university. Students were asked to complete an online questionnaire designed to elicit information regarding frequency of alcohol consumption, student experience with alcohol-related consequences, questions that measured eating and exercise practices in relation to alcohol consumption, and stimulant use. Data revealed that 28.3% (n = 108) of participants reported being unhappy with their current weight and 11.6% (n = 46) reported that they were completely dissatisfied with their current weight. Among the sample, 1.8% (n = 7) was receiving treatment for an eating disorder by a health care professional.

Approximately 9.1% (n = 36) participants reported a clinical diagnosis of Attention Deficit Hyper-Activity Disorder (ADHD), and 6.1% (n = 24) reported taking a prescribed medication for the diagnosis. Out of the 24 participants taking an ADHD prescription, 6 reported (25%) taking their medication in excess to increase academic performance. In regard to alcohol consumption, 88.1% (n = 349) reported ever consuming an alcoholic beverage. On average, the participants drank 2.2 (± 1.37) days per week. During a typical drinking occasion, participants consumed on average 4.6 (± 2.82) alcoholic beverages. Roughly, 24.2% (n = 96) of participants reported a misuse of prescription stimulants. Of these participants, 7% (n = 7) reported misusing prescription stimulants to feel better, get high, or prolong the effects of alcohol or other substances. Approximately 2% (n = 2) of participants reported misusing stimulants for the purpose of weight loss. In conclusion, data from this study indicated that misuse of prescription stimulants and drunkorexia were positive predictors for alcohol-related problems.

2.2.6.5 Sleep Disorders

Sleep disorders are highly prevalent among the college student population with an increased rate of occurrence in students with mental and/or physical disorders (Buboltz, Brown, & Soper, 2001; Stein, Belik, Jacobi, & Sareen, 2008). Research suggests that up to 60% of all college students suffer from poor sleep quality and nearly 7.7% meet the criteria for insomnia (Lund, Reider, Whiting, & Prichard, 2010; Gaultney, 2010; Schlarb, Friedrich, & Claben, 2017). Insufficient sleep has been found to be associated with poor cognitive performance and absenteeism, as well as certain lifestyle behaviors such as cigarette smoking, substance misuse, and physical inactivity (Trockel, Barnes, & Egget, 2000).

Vail-Smith, Felts, and Becker (2009) aimed to determine the prevalence of inadequate sleep among undergraduate college students and the behavioral factors associated with sleep quality. The sample population consisted of undergraduate students enrolled at a southeast public university. A total of 859 students participated in the study, consisting primarily of females (n = 596, 70%). The participants completed a 100-item survey based on the CDC's National College Health Risk Survey which analyzes health risk behaviors such as: unintentional and intentional injuries, tobacco use, frequency of alcohol and illicit drug use, sexual behaviors, dietary behaviors, and physical inactivity. In addition to this survey, participants also answered questions from the Sleep Quality Index (SQI), an eight-item self-report inventory of sleep difficulties (Urponen, Partinen, Vuori, & Hasan, 1991). Data from the Sleep Quality Index indicated that of the 859 respondents, 6.3% reported very good sleep quality (a score of 0-1), 76.6% reported occasional sleep problems (a score of 2-8), and 11.8% reported poor sleep quality (a score of 9-16). Data from this study suggest that sleep quality (mean SQI scores) was correlated with various health risk behaviors such as physical aggression, suicide ideation, smoking, alcohol consumption, marijuana use, and physical inactivity. Sixty participants (7.0%) indicated that they had considered attempting suicide in the 12 months prior to the study. The students with suicide ideation reported a mean SQI score of 7.73 ($\pm$ 2.98), which was significantly higher ($F_{(1,847)}$ = 11.73, $p < 0.001$) than participants not indicating a suicidal consideration (n = 788, mean = 5.78, $\pm$ 3.02). Post-hoc analysis revealed that participants who did not consume alcohol (n = 218, mean SQI score = 5.50, $\pm$ 3.14) had a significantly lower SQI score than those reporting regular alcohol consumption (n = 35, mean SQI score = 7.23, $\pm$ 2.97). These data support past research

demonstrating that a large majority of college students self-report occasional sleep disturbances (Buboltz, Brown, & Soper, 2001).

Taylor and Bramoweth (2010) examined the patterns and consequences associated with inadequate sleep. Undergraduate students (n = 1,039, 72% female; age: mean = 20.39 years, ± 3.93) were required to complete a questionnaire and a 1 week sleep diary. The sleep diary instructed participants to complete the log each morning upon waking up, which asked about nightly bedtime, wake time, nighttime awakenings, and overall sleep quality. Participants were also required to report any medication or alcohol used as a sleep aid and stimulants that were used for the purpose of alertness and concentration. Statistical analysis revealed a significant difference between weekday and weekend comparisons in relation to total sleep time, bedtime, and wake time (p < 0.001). Sixteen percent of participants reported falling asleep while driving and 2% reported a motor vehicle accident as a consequence of inadequate sleep. In addition, males (21%) were significantly more likely to fall asleep at the wheel than females (14%; χ^2 = 6.07, p = 0.014). Alcohol was used as a sleep aid by 11.36% of participants, among which males (16.1%) were significantly more likely to use alcohol as a sleep aid than females (9.8%; χ^2 = 6.92, p = 0.006). This study found that, among the sample population, inadequate sleep was common and substances such as alcohol and medication were frequently used as an aid.

The transitional period from secondary to post-secondary education presents many challenges that may increase an individuals' risk of developing insomnia (Taylor, Bramoweth, Grieser, Tatum, & Roane, 2013). Those with insomnia report a higher incidence of fatigue, irritability, mental illness, and an overall poorer quality of life (Walsh, 2004). Taylor, Bramoweth, Grieser, Tatum, and Roane (2013) evaluated the prevalence of insomnia

and related correlates such as mental health status, quality of life, and substance use. A large sample of college students attending the University of North Texas (n = 1,074, mean age 20.39 years) were asked to complete a week-long sleep diary and a questionnaire assessing various daytime functioning domains (i.e., fatigue, quality of life, depression, anxiety, stress, academic achievement, and substance use). Statistical analysis revealed that, of the 1,039 students, 57.1% were normal sleepers, 9.5% had chronic insomnia, 6.5% complained of insomnia symptoms, but did not meet diagnostic criterion, and 26.9% met the criteria, but did not disclose a complaint. These data also indicated that the average duration of the insomnia complaint was 41.7 months. The normal sleeper group reported more alcohol problems, as measured by the Alcohol Use Disorders Identification Test (p = 0.043). A Chi-Square analysis found that the chronic insomnia group had higher rates of hypnotic drug use (10.1% vs 1.9%), χ^2 (2, n = 692) = 20.04, p = 0.001, and stimulant use (2.0% vs. 0.0%) χ^2 (2, n = 692) = 12.02, p = 0.001, compared to the normal sleeper group. ANOVA analysis found that the chronic insomnia group had significantly worse fatigue, as well as significantly increased levels of depression, anxiety, stress, and a lower quality of life (p ≤ 0.05). Furthermore, the chronic insomnia group had significantly higher rates of clinical depression (26.3% vs. 8.6%, OR = 3.05: 95% CI 2.00-4.66) and anxiety (15.2% vs. 5.4%; OR 2.81: 95% CI 1.58-4.99). In conclusion, a significant number of students met the criteria for chronic insomnia, reporting higher levels of mental illness and a decreased quality of life; however, no significant difference between groups on excessive daytime sleepiness, academic achievement, or substance misuse was found.

2.2.6.5 Post-Traumatic Stress Disorder

The characteristics of a traumatic experience consist of an event that evokes fear,

helplessness, or horror in the response to threat of harm or death (Friedman, Resick, Bryant,

& Brewin, 2013). Individuals who are exposed to a traumatic event are at an increased risk at

developing post-traumatic stress disorder (PTSD), among other related psychiatric disorders

such as depression, panic disorder, anxiety, and substance abuse (Yehuda, 2002). PTSD is

defined as a mental health condition that is triggered by either experiencing or witnessing a

terrifying event (https://www.mayoclinic.org/diseases-conditions/post-traumatic-stress-

disorder/symptoms-causes/syc-20355967). The DSM-IV criterion for a PTSD diagnosis

requires that an individual must be directly or indirectly exposed to trauma that threatens

serious injury, bodily compromise, or death (Elhai et al., 2012).

Elhai and Simons (2007) investigated trauma exposure and post-traumatic stress

disorder associations with prior mental health treatment use among a sample of college

students attending a Midwestern university. Participants (n = 300, 201 females and 98 males)

were administered a modified version of the Stressful Life Events Screening Questionnaire

(Goodman, Corcoran, Turner, Yaun, & Green, 1998), in addition to the PTSD Symptom

Scale, Attitudes Toward Seeking Professional Psychological Help Scale, and a mental health

treatment use survey. Analysis revealed that 210 participants (74.5%) experienced at least

one traumatic event (violent crime trauma, n = 119, 42.2%; nonviolent crime trauma n = 174,

62.4%). The most prevalent reported traumas included the unexpected death of a loved one

(n = 110, 39.0%), being physically harmed by a non-caregiver (n = 56, 19.9%), and suffering

a life-threatening accident (n = 58, 20.6%). Additional findings were that mental health

treatment use was most commonly associated with violent crime and non-violent crime

trauma frequency (F (1,280) = 13.19, p < 0.001). Additionally, prior mental health treatment was not associated with gender or prior PTSD diagnosis.

2.2.7 Overweight and Obesity

The prevalence of overweight and obesity has increased drastically over the past several decades among both children and adults residing in the United States (Mokdad, Bowman, Ford, et al. 2001). The consequences associated with the obesity epidemic include the development of chronic diseases, in addition to the major burden placed on health care systems (Wolf & Colditz, 1996). Similar trends related to overweight and obesity have also been seen among the college population (Flegal, Carroll, Kit, & Ogden, 2012). The years of postsecondary education serve as an influential time period for forming adult behaviors, particularly with regard to diet, physical activity, and other lifestyle practices (Racette, Deusinger, Stube, Highstein, & Deusinger, 2005).

Nelson, Gortmaker, Subramaniam, Cheung, and Wechsler (2007) examined the prevalence, social disparities, and behavioral correlates of overweight and obesity among a sample of college students in the United States. Data were obtained from the Harvard School of Public Health College Alcohol Study. For this analysis, the sample consisted of 24,613 undergraduate students under the age of 25 (mean age = 20.4, ± 1.6). Participants were required to report current height and weight, race/ethnicity, socioeconomic status, frequency and type of physical activity, and screen time. Statistical analysis revealed that the prevalence of overweight increased significantly from 21.7% in 1993 to 26.8% in 1999, adjusting for gender, ethnicity/race, and academic year (AOR: 1.33, 95% CI: 1.21-1.46, p < 0.001). Similar results were found for obesity with an increase from 4.1% in 1993 to 6.5% in 1999 (AOR: 1.64, 95% CI: 1.39-1.93, p < 0.001). Among the male ethnic/racial groups,

overweight was more prevalent among African Americans and Hispanics. Among females, similar ethnic/racial patterns were observed. In regard to student behavior, males were significantly more likely to engage in physical activity compared to females (80% vs 70%, $p < 0.001$). In addition, those students who participated in regular physical activity were less likely to be obese among both females (AOR: 0.56, 95% CI: 0.47 – 0.67) and males (AOR: 0.63, 95% CI: 0.52- 0.76). These findings were consistent among all ethnic/racial groups. In conclusion, the findings from this study suggest the presence of social disparities in overweight and obesity among the sample of college students surveyed.

Desi, Miller, Staples, and Brayender (2008) aimed to determine whether abnormal eating perceptions and behaviors were related with overweight and obesity among a sample of college students. Student participants ($N = 4,201$) completed an online survey that included demographic questions and the Eating Attitudes Test-26 (EAT-26) questionnaire, which is traditionally used to screen for anorexia nervosa and bulimia nervosa. For this study, researchers divided participants into normal weight and overweight/obese groups and assessed frequency of physical activity, EAT-26 scores, and purging behaviors. Data indicated that, compared to normal-weight participants, overweight participants presented an increased fear of bingeing, preoccupation with food, desire to be thinner, and participation in dieting behavior. Statistical analysis also revealed that mean body mass index increased with age and physical inactivity ($p < 0.001$). In conclusion, these data imply that physical inactivity, disordered eating behaviors, and perceptions are associated with increased rates of overweight/obesity among these students.

A similar study conducted at an Eastern North Carolina university sought to determine the rates of overweight and obesity, as well as eating behaviors among

undergraduate students, with a specific interest in ethnic backgrounds (Sira & Pawlak, 2010).

The study sample included 582 students (106 males, 420 females) between the ages of 20 to

25 (mean age = 20.35, ± 2.66). Participants were required to self-report height and weight,

demographic information, as well as complete the eating attitudes (EAT 26) scale. An

ANOVA revealed a significant difference of mean BMI between gender and ethnic

background. Data indicated that 52.7% of participants had a normal BMI, 15.2% were

underweight, 21.3% were overweight, and 10.8% were obese. Further, roughly 12% of

participants reported disordered eating behaviors. These data support the belief that

disordered eating patterns and unhealthy dieting are common among college students,

especially females.

Odlaug et al. (2015) sought to investigate the prevalence of overweight and obesity in

U.S. college students with an emphasis on the relationship between various mental health

disorders and academic success. A total of 2,108 undergraduate and graduate students

(35.1%; mean age 22.6, ± 5.1; 78% Caucasian; 41.8% male) attending a large Midwestern

university completed an online-administered survey which elicited information regarding

student mental health status, stress level, quality of life, general physical health, and

demographic information. Responses from 1,765 students were included in the data analysis.

Among these students, 356 (20.2%) were overweight and 136 (7.7%) were obese based on

their body mass index (BMI). The overweight participants were significantly more likely to

lose weight than their normal weight peers and were more likely to use dieting and diet pills

to achieve their goal weight. Obese male participants reported significantly more depressive

symptoms compared to normal weight male participants (F [2,64] = 5.19, p = 0.006), while

overweight females had higher rates of stress (F [2,944] = 4.09, p = 0.017). In terms of

mental illness, obese male participants were significantly more likely to report a major depressive disorder, compared to overweight and normal weight participants (28.6%, 9.5% and 10.6%, respectively), p < 0.001. Further, obese females reported significantly higher rates of being diagnosed with major depressive and panic disorder. Anxiety, panic, and social anxiety disorders were more common in obese males compared to normal weight male participants.

2.3 Summary and Conclusions

The transitional period to post-secondary education along with heightened stressors related to academic demands, financial burdens, and social and environmental barriers may be contributing to the high prevalence of college student food insecurity (Pancer, Hunsberger, Pratt, & Alisat, 2000; Cason & Wenrich, 2002; Kerr, Johnson, Gans, & Krumrine, 2004). Few studies have focused on the potential unfavorable impacts of physical, mental, and learning disorders on the food security status of college students. Investigators have proposed that food insecurity may be associated with higher odds of mental illness and substance-use behaviors (Bruening, Brennhofer, van Woerden, Todd, & Laska, 2016). Additionally, research has suggested that young people with disabilities are more susceptible to food insecurity, as this subgroup may face exacerbated economic difficulty related to the extra expenditures that are associated with their medical condition. (Coleman-Jenson & Nord, 2013; Houtenville & Brucker, 2014; Brucker, Mitra, Chaitoo, & Mauro, 2015). Thus, the significant health implications speculated in the research may attribute to the persistence of food insecurity among the college student population.

Chapter Three

Protocol

3.1 Participants and Recruitment

A randomized, computer-generated sample of 6,000 students enrolled at Appalachian State University (ASU) during the spring, 2018 semester were sent electronic recruitment letters, using email addresses obtained from the Office of Institutional Research, Assessment and Planning (Appendix A). Inclusion criteria were any gender identity, undergraduate or graduate status, at least 18 years of age, on or off- campus residence, and any race/ethnic or religious affiliation. Recruitment letters were sent as two email blasts of 3,000 emails in mid-February and mid-March, followed by reminder emails one and two weeks later, and by a final reminder in mid-April, as recommended by Dillman, Smyth, and Christian (2009). Data collection concluded on April 30, 2018. This time frame was chosen to obtain data that better reflected the students' usual food security status by avoiding the period at the beginning of the spring semester when students may have returned to campus after the holidays with supplies of food from home and with financial resources acquired from family or between-semester employment.

Students who wished to continue in the study clicked a link in the recruitment letter that described the elements of informed consent (Appendix B), and afterwards clicked a "next" button that took them to the first questionnaire item. The students who completed the questionnaire were offered the opportunity to enter a drawing to win one of two $50 gift cards from Amazon.com. Those who chose to enter the drawing clicked a link that appeared after the final questionnaire item that took them to a screen where they entered their ASU email address. This link was detached from the screen containing their answer choices to

honor student confidentiality. Approval to conduct this study, as well as all study procedures, was granted by the Office of Research Protections at ASU.

3.2 Questionnaire

Data were collected using an anonymous, cross-sectional online questionnaire administered using Qualtrics survey software (Qualtrics, Provo, UT) (Appendix C). The initial items comprised a modified version of the ten-item USDA/ERS Adult Food Security Survey Module (AFSSM) (https://www.ers.usda.gov/media/8271/hh2012.pdf) such that the items were framed in the context of the students' usual access to food since enrolling at ASU. The AFSSM focuses on the quantity and quality of the usual available food supply, and on access to resources for accessing food. These questions were used to assign the students to either a high, marginal, low, or very low food secure category, depending on the number of affirmative responses, i.e., "often," "sometimes," "yes," "almost every month," and "some months, but not every month" (Figure 1).

Figure 1. *Modified Ten–Item USDA/ERS Adult Food Security Survey Module (AFSSM)*

As a student at ASU …

1. I have worried whether my food would run out before I got money to buy more.
        Often   Sometimes   Never

2. The food I have to eat just doesn't last, and I don't have money to get more.
        Often   Sometimes   Never

3. I can't afford to eat balanced meals.
        Often   Sometimes   Never

4. There have been times when I have cut the size of my meals or skipped meals because I didn't have enough money for food.
        Yes   No

If you answered "Yes" to question 4, please complete question 5. Otherwise, skip to question 6.

5. How often did this happen?
_____ Almost every month
_____ Some months, but not every month
_____ In only one or two months

6. There have been times when I have eaten less than I thought I should because I didn't have enough money for food.
     Yes   No

7. There have been times when I was hungry but didn't eat because I didn't have enough money for food.
     Yes   No

8. I have lost weight because I didn't have enough money for food.
     Yes   No

9. There have been times when I have not eaten for a whole day because I didn't have enough money for food.
     Yes   No

If you answered "Yes" to question 9, please complete question 10.

10. How often did you not eat for a whole day because there wasn't enough money for food?
_____ Almost every month
_____ Some months, but not every month
_____ In only one or two months

       The students next checked, from an extensive list of physical health, mental health, and learning disorders compiled with guidance from pertinent literature (Wolf, Ollendick, & Bray, 2001; Stovner et al., 2007; American College Health Association, 2008; Gallagher, 2008; Flegal, Carroll, Kit, & Ogden, 2012) those conditions for which they had been diagnosed by a medical professional. These disorders were assigned to 13 categories based on the classification system of Escott-Stump (2015) as follows: autism spectrum (2 disorders), cardiovascular (3 disorders), endocrine (3 disorders), gastrointestinal (12 disorders), hematology (1 disorder), immunological (5 disorders), learning (6 disorders),

musculoskeletal (7 disorders), neurological (9 disorders), psychiatric (17 disorders),

pulmonary (2 disorders), body weight (2 disorders), and other (5 disorders) (Figure 2).

Figure 2. *Physical Health, Mental Health, and Learning Disorders*

Medical and Learning Disorders
Autism Spectrum Disorders
Asperger Syndrome
Autism
Cardiovascular Disorders
Heart Disease
Hypertension
High Blood Cholesterol
Endocrine Disorders
Poly Cystic Ovarian Syndrome
Type 2 Diabetes
Type 1 Diabetes
Gastrointestinal Disorders
Acid Reflux
Lactose Intolerance
Frequent Nausea
Frequent Abdominal Cramps
Frequent Constipation
Indigestion
Frequent Diarrhea
Gallbladder Disorder
Irritable Bowel Syndrome with Constipation
Irritable Bowel Syndrome with Diarrhea
Ulcers
Inflammatory Bowel Disease
Hematology Disorders
Anemia
Immunological Disorders
Milk Allergy
Nut Allergy
Celiac Disease
Soy Allergy
Fish/Seafood Allergy
HIV/AIDS
Learning Disorders
Auditory Process Disorder
Dyslexia
Dyspraxia
Executive Functioning Disorder
Nonverbal Learning Disability
Visual Perceptual Motor Deficit

Figure 2. *Physical Health, Mental Health, and Learning Disorders (continued)*

Medical and Learning Disorders
Musculoskeletal Disorders
Back Pain
Bone Fractures
Carpel Tunnel Syndrome
Arthritis
Rheumatoid Arthritis
Neurological Disorders
Migraine Headaches
Attention Deficit Hyperactivity Disorder
Attention Deficit Disorder
Traumatic Brain Injury
Seizure Disorder
Epilepsy
Multiple Sclerosis
Tourette Syndrome
Muscular Dystrophy
Overweight and Obesity
Overweight
Obesity
Psychiatric Disorders
Depression
Generalized Anxiety Disorder
Social Anxiety Disorder
Panic Disorder
Post-Traumatic Stress Disorders
Bipolar Disorder
Obsessive Compulsive Disorder
Binge Eating Disorder
Anorexia Nervosa
Alcohol Addiction
Body Dysmorphic Disorder
Borderline Personality Disorder
Bulimia Nervosa
Phobias
Drug Addiction
Schizophrenia
Pulmonary Disorders
Asthma
Cystic Fibrosis
Other Disorders
Visually Impaired
Vertigo
Hearing Impaired
Chronic Fatigue Syndrome
Cancer

The list of disorders was followed by a 28-item Coping Strategies Scale (CSS) consisting of behaviors used by food insecure individuals to access food (Kennan, Sadani, & Adler, 2003; Dharmasena, Bessler, & Capps, 2016; Pinard et al., 2016; Knight, Probst, Liese, Sercy, & Jones, 2016). The students were asked to indicate the frequency, i.e., "never," "seldom," "sometimes," or "often" with which they had used each coping strategy during a typical semester at ASU. These strategies were assigned to four subscales based on their focus as follows: Food Access (11 strategies), Saving (6 strategies), Selling (4 strategies), and Social Support (6 strategies). The Cronbach alpha reliability coefficient for the entire CSS was 0.806.

Figure 3. *Coping Strategies Subscales*

Food Access Subscale (n = 11)
Ate smaller meals to make the food last longer
Stretched leftovers to make them last longer
Ate more than normal when food was plentiful
Ate less healthy foods so you could eat more (cheap, processed food such as ramen noodles, frozen pizza, candy, etc.)
Accessed free food at your food-related job (e.g., restaurant, grocery store, dining hall, convenience store, etc.)
Dumpster Diving
Taken leftover foods home from on-campus dining hall
Held one or more jobs at the same time to have more money to buy food
Used a credit card to buy food
Participated in paid research study/clinical trial to buy food
Stole money to buy food

Saving Subscale (n = 6)
Taken fewer classes to save tuition money to buy food
Used less utilities (e.g., electricity, water) to buy food
Planned menus before buying food
Cut out food coupons
Decreased medication dose or skipped medical appointments to buy food
Shared grocery and/or meal costs with others

Selling Subscale (n = 4)
Sold textbooks
Sold personal possessions to buy food (e.g., clothes, jewelry, etc.)
Sold your blood/plasma to buy food
Sold recreational drugs to get money for food

Figure 3. *Coping Strategies Subscales (continued)*

Social Support Subscale (n = 6)
Borrowed money from family or friends to buy food
Attended on-campus or community functions where there was free food
Ate meals at places where you can "pay what you can" (e.g., FARM Café)
Accessed food from a food pantry (e.g., Hunger and Health Coalition, Hospitality House, and East Hall food pantry)
Attended free meal events in the community (e.g., Hospitality House, churches, etc.)

Next the students completed a 16-item Money Expenditure Scale (MES) developed by the authors to measure the frequency with which the students had spent money on nonfood items during the previous semester, with the response options "never," "seldom," "sometimes," or "often." These items were assigned to four subscales as follows based on their focus: Substance Use (3 items), Transportation (3 items), Personal Concerns (4 items), and Medical Expenses (5 items). The Cronbach alpha reliability coefficient for the overall MES was 0.312.

Figure 4. *Money Expenditure Subscales*

Substance Use Subscale (n = 3)
Alcohol
Cigarettes
Recreational drugs
Transportation Subscale (n = 3)
Car repairs
Gasoline
Public transportation
Personal Concerns Subscales (n = 4)
Personal items (e.g., clothes, makeup, etc.)
Personal hygiene items (e.g., soap, toothpaste, deodorant, etc.)
Tattoos
Entertainment (e.g., concerns, movies, sports events, video games, etc.)
Medical Expenses Subscale (n = 5)
Prescribed medications
Over-the-counter medications (e.g., pain relievers, digestive medications, allergy medications, etc.)
Medical supplies (e.g., glucose testing supplies, medical foods etc.)
Health care appointments
Medical devices and equipment

The students next checked, from a list compiled by the authors, those perceived

barriers that they believed made it difficult for them to access food either on-campus, off-

campus, or at both locations. These potential barriers were assigned to five subscales based

on their themes as follows: Knowledge Subscale (5 items), Affective Subscale (3 items),

Food Access Subscale (7 items), Personal Concerns Subscale (5 items), and Practical

Concerns Subscale (6 items).

Figure 5. *Perceived Barriers Subscales for Accessing Food On-Campus, Off-Campus, or at Both Locations*

Knowledge Subscale (n = 5)
I don't know how to ask for help accessing food
I don't have food preparation skills
Available foods are not familiar to me
I don't know where to find places to get food
I don't know where to get information about food ingredients
Affective Subscale (n = 3)
I feel overwhelmed/stressed planning meals or making food choices
I feel embarrassed to ask for help accessing food
I am not interested/motivated to access food
Food Access Subscale (n = 6)
I don't have transportation
I can't find the foods I like
I have safety concerns getting food at certain times of the day
Foods are not always healthy/nutritious
I require assistance with mobility that makes accessing food difficult
I require assistance accessing or preparing food
Personal Concerns Subscale (n = 4)
Available foods do not taste good to me
Available foods are not culturally appropriate
Available foods do not support my religious beliefs
My family doesn't want me to ask for help accessing food
Practical Concerns Subscale (n = 6)
My meal plan runs out
I don't have enough money to purchase healthy/nutritious foods
I don't have time to purchase food
I don't have time to eat regular meals
Food preparation is inconvenient
I don't have cooking equipment

The list of perceived barriers was followed by a list of possible sources of social support published in the National Health and Nutrition Examination Survey (2009). The students were asked to check those they believed would be most helpful for improving their regular access to nutritious food on-campus (8 items)," off-campus (4 items)," or at both locations (14 items) (Figure 6).

Figure 6. *Sources of Social Support for Improving Food Access On-Campus, Off-Campus, and at Both Locations*

Types of Assistance
Provide a wider variety of food options at on-campus locations
Provide a wider variety of food options at community food outlets like grocery stores and restaurants
Provide more nutritious food options at on-campus locations
Provide more nutritious food options at community food outlets like grocery stores and restaurants
Provide better transportation to on-campus dining and food services including the on-campus food pantry
Provide better transportation to community food outlets like grocery stores and restaurants
Provide more allergen-friendly food options and labeling information at on-campus locations
Provide more allergen friendly food options and labeling information at food outlets like grocery stores and restaurants
Extend operational hours of on-campus dining halls and markets
Less expensive meal plan cards
Lower priced nutritious foods at on-campus dining halls and markets
More work study job opportunities
Personal assistance with shopping, preparing, and cooking food
Get a roommate
More financial aid at school
Financial help from others (e.g., parents and friends)
Learn how to make a budget for living expenses
Learn how to budget food money for eating out
Learn time management for meal planning and preparation
Learn how to shop for food
Learn how to make nutritious food options
Learn how to follow my special diet
Learn how to plan meals
Learn how to eat healthy
Learn how to grow food
Learn how to access foods that meet my cultural needs

The students next rated their academic performance in four areas by completing an Academic Progress Scale (APS) that focused on the following variables: overall progress in school including graduating on time, class attendance, attention span in class, and understanding of concepts taught in class. The students self-rated their performance in each area by choosing either "poor," "fair," "good," or "excellent."

Part three of the questionnaire elicited information concerning sociodemographic, academic, health, food preparation, and dietary variables. The sociodemographic variables were: gender identity, age, marital status, presence of dependent children in the household, race/ethnic affiliation, employment status, personal monthly income, and annual family income. The academic variables were: year in school, international vs domestic student status, part-time vs full-time student, declared academic major, on-campus vs. off-campus residence, grade point average, financial aid status, and meal plan participation. The health-related variables were perceived health status with the answer choices "poor," "fair," "good," or "excellent," and self-reported height and weight which were used to calculate body mass index (BMI). The variables related to food preparation assessed how frequently the students cooked for themselves or for others, i.e., "often", "sometimes", or "never", and their self-rated cooking skills by choosing either "poor", "fair", "good", or "excellent". The dietary variables were estimates of the number of times per day the students ate from the following groups: grains/cereals, vegetables/juices, fruits/juices, meat/fish/poultry, other protein foods (e.g., eggs, peanut butter, nuts etc.), dairy foods, and sweets, and identification of the food groups they would eat more from if they had greater access. Lastly, the students checked, from a list of negative emotions (12 terms) and positive emotions (4 terms) all of the terms that best described their feelings regarding their current food access (Figure 7), and indicated

whether they could use "a lot more," "some more," or "a little more" support to access food. The option "I do not need help accessing food" was also provided.

Figure 7. *Terms Describing Feelings Toward Current Food Situation*

Positive emotions
Satisfied
Secure
Pleased
Fine/OK
Negative emotions
Embarrassed
Anxious
Angry
Ashamed
Worried
Resentful
Guilty
Insecure
Sad
Humiliated
Helpless
Deprived

3.3 Pilot Testing

An attempt was made in January 2018 to pilot test the questionnaire online using Qualtrics survey software (Qualtrics, Provo, UT) with a randomized, computer-generated sample of 50 students whose email addresses were provided by the Office of Institutional Research, Assessment, and Planning. However, since no questionnaires were submitted in the time allowed, the questionnaire was pilot tested with 42 students enrolled in an introductory nutrition class at ASU. Since this course serves to meet a general education requirement, registered students can have freshmen through senior standing and can have any declared major, or may not yet have declared their major. However, no graduate students were enrolled in the section of the course involved in the pilot test. An electronic recruitment letter with a link to the online questionnaire was emailed to the students on February 1, 2018,

and data were collected over a five-day period. This pilot study was not anonymous since the

participating students received five extra credit points, requiring that they disclose their

name. Based on student feedback, one entry was added to the list of medical disorders, i.e.,

polycystic ovarian syndrome, and two items were added to the list of sources of social

support for accessing food, i.e., make dormitory cooking equipment more accessible and

extend operational hours of on-campus dining halls and markets.

3.4 Statistical Analyses

Data were analyzed using SPSS statistical software (IBM Corp. Released 2017. IBM

SPSS Statistics for Macintosh, Version 25.0. Armonk, NY: IBM Corp.). Only data provided

by food insecure students were analyzed, in keeping with the study objectives. Frequencies

and percentages were calculated on all variables. The students' food security status was

determined using the USDA/ERS scoring system for the 10 AFSSM questions, such that zero

affirmative answers reflected high food security, 1-2 marginal food security, 3-5 low food

security, and 6-10 very low food security (https://www.ers.usda.gov/topics/food-nutrition-

assistance/food-security-in-the-us/measurement/). In accord with USDA/ERS definitions,

students whose scores reflected low or very low food security comprise the food insecure

group, while those whose scores reflected marginal or high food security comprised the food

secure group for data analysis.

When scoring the 28-item CSS, 1 point was allotted to the "Never", 2 points to the

"Seldom", 3 points to the "Sometimes", and 4 points to the "Often" response, with possible

scores ranging from 28 to 112 points. The same point allotment was used when scoring the

16-item MES, with scores ranging from 16 to 64 points. Higher scores on the CSS and MES

reflected more frequent adoption of coping and spending behaviors, respectively. The 4-item

APS, and the single variables measuring perceived health status and cooking skills were scored by allotting 1 point to the "poor," 2 points to the "fair," 3 points to the "good," and 4 points to the "excellent" response. Scores on the APS could range from 4 to 16 points, while scores on the perceived health status and cooking skills items could range from 1 to 4 points. Correlational analyses assessed relationships between the students' AFSSM scores and personal and family income, CSS, MES, and APS scores, number of perceived barriers to food access on and off campus, GPA, and the number of times per day food groups were consumed. Chi-square analyses were performed to compare proportions of food insecure students with and without disorders on sociodemographic, anthropometric, academic, use of coping strategies, money spending behaviors, perceived barriers to food access, health, cooking-related, dietary, and social support variables. Independent-samples t-tests were performed to compare mean scores of the two groups on the CSS, MES, and APS scales, perceived barriers to food access, and social support. Statistical significance was $p < 0.05$.

<center>**Chapter Four**</center>

Results

4.1 Characteristics of Food Insecure Students

Questionnaires were submitted by 493 of the 6,000 recruited students (8.2%), of

which 56 were discarded due to missing AFSSM data and 190 because these scores classified

the students as food secure. This yielded a final sample of 247 food insecure students.

Diagnosed disorders were reported by 166 (67.2%) of these students, while 81 reported no

disorders. Among the students with disorders, 160 (96.3%) reported one or more medical

disorders and 6 (3.6%) reported one or more learning disorders. Table 1 shows the

sociodemographic, health, and lifestyle characteristics of the food insecure students with

disorders, of those without disorders, and of the overall sample.

Summarizing the data in Table 1, the gender distribution of the entire sample was

approximately 20% male, 60% female, and 20% nondisclosed. The students' mean age was

21.44 years (± 2.74, range 18 to 40). Almost 75% self-classified as non-Hispanic white, and

approximately 20% were freshman/sophomores, 50% juniors/seniors, and 10% graduate

students. More than 80% were enrolled full-time and about 20% lived on-campus and 60%

off-campus. Economic data revealed that about 50% of the students held one or more part-

time jobs, 60% were financial aid recipients, 60% reported having a monthly income of less

than $500, and about 60% did not participate in a university meal plan.

Findings concerning health and cooking variables indicated that the students' mean

BMI (calculated from self-reported heights and weights) was 25.09 kg/m^2 (±5.9, range 15.78

to 48.08). Based on their BMIs, about 3% of the students were classified as underweight,

50% normal weight, 20% overweight, and 12% obese. Additionally, approximately 50%

perceived their health as either "good" or "excellent," while about 35% regarded their health

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as either "fair" or "poor." Additionally, almost 75% "sometimes" or "often" cooked for

themselves or others and over 50% perceived their cooking skills as "good" or "excellent."

Table 1. *Characteristics of Food Insecure Students with Disorders (n = 166), without Disorders (n = 81), and Overall Sample (n = 247)*

Characteristic	Food Insecure Sample		Food Insecure Students with Disorders		Food Insecure Students without Disorders	
	n	%	n	%	n	%
Food security classification						
Low Food Secure	107	43.3	61	36.7	46	56.8
Very Low Food Secure	140	56.7	105	63.3	35	43.2
Gender						
Male	55	22.3	33	19.9	22	27.2
Female	150	60.7	115	69.3	35	43.2
Other	4	1.6	4	2.4	0	0
Missing	38	15.4	14	8.4	24	29.6
Age						
18-19	43	17.4	30	18.1	13	16.0
20-21	89	36.0	63	38.0	26	32.1
22-25	61	24.7	48	28.8	13	16.0
25+	15	6.0	13	6.6	5	6.1
Missing	39	15.8	14	8.4	25	30.9
Race/ethnicity						
African American, not of Hispanic origin	9	3.6	7	4.2	2	2.5
African American, White	3	1.2	2	1.2	1	1.2
American Indian	4	1.6	2	1.2	2	2.5
Asian	1	0.4	0	0	1	1.2
Hispanic	12	4.9	10	6.0	2	2.5
White, not of Hispanic origin	179	72.5	128	77.1	51	63.0
Other	3	1.2	2	1.2	0	0

Table 1. *Characteristics of Food Insecure Students with Disorders (n = 166), without Disorders (n = 81), and Overall Sample (n = 247) (continued)*

Characteristic	Food Insecure Sample		Food Insecure Students with Disorders		Food Insecure Students without Disorders	
	n	%	n	%	n	%
Academic year						
Freshman/sophomore	60	24.3	42	25.3	18	22.2
Junior/senior	117	47.4	84	50.6	33	40.7
Graduate student	25	10.1	19	11.4	6	7.4
Other	2	0.8	2	1.2	0	0
Missing	43	17.4	19	11.4	24	29.6
Residency						
On-campus	49	19.8	34	20.5	15	18.5
Off-campus	154	62.3	112	67.5	42	51.9
Missing	44	17.8	20	12.0	24	29.6
Employment status						
Unemployed	58	23.5	38	26.0	20	35.1
One-or-more part-time jobs	130	52.6	97	66.4	33	57.9
One full-time job	6	2.4	5	3.4	1	1.8
Other	9	3.6	6	4.1	3	5.3
Missing	44	17.8	20	12.0	24	29.6
Financial aid recipient						
Yes	156	63.2	115	69.3	41	50.6
No	48	19.4	32	19.3	16	19.8
Missing	43	17.4	19	11.4	24	29.6
Personal monthly income						
< $500	149	60.3	103	62.0	46	56.8
$501 - $1,000	43	17.4	37	22.3	6	7.4
$1,001 - $1,500	12	4.9	7	4.2	5	6.2
Missing	43	17.4	19	11.4	24	29.6
On-campus meal plan						
Yes	56	22.7	40	24.1	16	19.8
No	148	59.9	107	64.5	41	50.6
Missing	43	17.4	19	11.4	24	29.6

Table 1. *Characteristics of Food Insecure Students with Disorders (n = 166), without Disorders (n = 81), and Overall Sample (n = 247) (continued)*

Characteristic	Food Insecure Sample		Food Insecure Students with Disorders		Food Insecure Students without Disorders	
	n	**%**	**n**	**%**	**n**	**%**
Weight category by BMI						
Underweight	8	3.2	5	3.0	3	3.7
Normal weight	112	45.3	78	47.0	34	42.0
Overweight	41	16.6	33	19.9	8	9.9
Obese	29	11.7	23	13.9	6	7.4
Missing	57	23.1	27	16.3	30	37.0
Perceived health status						
Good/excellent	120	48.6	81	48.8	39	48.2
Fair/poor	84	34.0	66	39.7	18	22.2
Missing	43	17.4	19	11.4	24	29.6
Cook for self/others						
Often	108	43.7	75	45.2	33	40.7
Sometimes	81	32.8	61	36.7	20	24.7
Never	14	5.7	10	6.0	4	4.9
Missing	44	17.8	20	12.0	24	29.6
Perceived cooking skills						
Good/excellent	136	55.0	95	57.2	41	50.6
Fair/poor	68	27.6	52	31.3	16	19.8
Missing	43	17.4	19	11.4	24	29.6
Family yearly income						
< $15, 000	29	11.7	22	13.3	7	8.6
$15,000 - $24,999	11	4.5	8	4.8	3	3.7
$25,000 - $34,999	22	8.9	14	8.4	8	9.9
$35,000 - $49,999	34	13.8	23	13.9	11	13.6
$50,000 - $74,999	31	12.6	23	13.9	8	9.9
$75,000 - $99,999	22	8.9	14	8.4	8	9.9
$100,000 - $149,999	33	13.4	26	15.7	7	8.6
$150,000 - $199,999	11	4.5	7	4.2	4	4.9
> $200,000	9	3.6	9	5.4	0	0
Missing	45	18.2	20	12.0	25	30.9

Table 1. *Characteristics of Food Insecure Students with Disorders (n = 166), without Disorders (n = 81), and Overall Sample (n = 247) (continued)*

Characteristic	Food Insecure Sample		Food Insecure Students with Disorders		Food Insecure Students without Disorders	
	n	%	n	%	n	%
Marital status						
Not married	200	81.0	145	87.3	55	67.9
Married	6	2.4	5	3.0	1	1.2
Missing	41	16.6	16	9.6	25	30.9
Dependent children in household						
Yes	3	1.2	1	0.6	2	2.5
No	205	83.0	150	90.4	55	67.9
Missing	39	15.8	15	9.0	24	29.6
Academic Major						
Beaver College of Health Sciences	53	21.5	31	18.7	22	22.7
College of Arts and Sciences	87	35.2	67	40.4	20	24.7
College of Fine and Applied Arts	25	10.1	17	10.2	8	9.9
Hayes School of Music	6	2.4	4	2.4	2	2.5
Reich College of Education	18	7.3	16	9.6	2	2.5
Walker College of Business	14	5.7	11	6.6	3	3.7
Missing	44	17.8	20	12.0	24	29.6

Table 1-A compares food insecure students on sociodemographic, health, and lifestyle characteristics by disorder status. Summarizing the data in Table 1-A, findings revealed a significantly greater proportion of food insecure males and females with disorders compared to food insecure males and females without disorders. No significant difference emerged between the other variables analyzed in Table 1-A and participant disorder status.

Table 1-A *Chi-square comparisons of food insecure students (n=247) on sociodemographic, health, and lifestyle characteristics by disorder status*

FI classification	Disorder classification	χ^2	p-value
Low Food Secure Very Low Food Secure	Disorder No Disorder	5.433	<0.05*
Gender	**Disorder classification**	χ^2	**p-value**
Male Female	Disorder No Disorder	7.165	<0.05*
Race/ethnicity	**Disorder classification**	χ^2	**p-value**
African American, not of Hispanic Origin	Disorder	7.672	0.263
African American, White	No Disorder		
American Indian			
Asian			
Hispanic			
White, not of Hispanic origin			
Other			
Academic Year	**Disorder classification**	χ^2	**p-value**
Freshman/sophomore	Disorder	8.995	0.109
Junior/senior	No Disorder		
Graduate student Other			
Residency	**Disorder classification**	χ^2	**p-value**
On-campus	Disorder	0.205	0.650
Off-campus	No Disorder		
Employment status	**Disorder classification**	χ^2	**p-value**
Unemployment	Disorder	2.155	0.541
One-or-more part-time jobs	No Disorder		
One full-time job			
Other			
Financial aid recipient	**Disorder classification**	χ^2	**p-value**
Yes	Disorder	0.906	0.341
No	No Disorder		

Table 1-A *Chi-square comparisons of food insecure students (n=247) on sociodemographic, health, and lifestyle characteristics by disorder status (continued)*

On-campus meal plan	Disorder classification	χ^2	p-value
Yes	Disorder	0.015	0.902
No	No Disorder		

Weight category by BMI	Disorder classification	χ^2	p-value
Underweight	Disorder	2.848	0.416
Normal Weight	No Disorder		
Overweight			
Obese			

Perceived health status	Disorder classification	χ^2	p-value
Excellent/good	Disorder	2.710	0.438
Fair/poor	No Disorder		

Cooks for self/others	Disorder classification	χ^2	p-value
Often	Disorder	0.790	0.674
Sometimes	No Disorder		
Never			

Perceived cooking skills	Disorder classification	χ^2	p-value
Excellent/good	Disorder	2.710	0.438
Fair/poor	No Disorder		

[*] level of significance was $p < 0.05$

4.2 Prevalence of Medical and Learning Disorders Among Food Insecure Students

Table 2 shows the frequency counts and percentages in descending order for the medical and learning conditions by categories selected by the students. The top three categories were psychiatric conditions (n = 100, 40.5%), gastrointestinal conditions (n = 78, 31.6%), and neurological conditions (n = 56, 22.7%). Table 3 shows these data for the specific disorders within each category selected by the students. The top five conditions were depression (n = 61, 24.7%), generalized anxiety disorder (n = 46, 18.6%), acid reflux (n = 39, 15.8%), back pain (n = 34, 13.8%), and both migraine headache and attention deficit hyperactivity disorder (n = 22, 8.9%).

Table 2. *Frequencies and Percentages for Medical and Learning Disorder Categories Selected by Food Insecure Students (n = 166)*

Disorder Category	n	%
Psychiatric Disorders	100	40.5
Gastrointestinal Disorders	78	31.6
Neurological Disorders	56	22.7
Musculoskeletal Disorders	45	18.2
Overweight/Obesity	24	9.7
Hematology Disorders	18	7.3
Pulmonary Disorders	16	6.5
Immunological Disorders	11	4.5
Endocrine Disorders	11	4.5
Cardiovascular Disorders	9	3.6
Other Disorders	9	3.6
Learning Disorders	6	2.4
Autism Spectrum Disorders	1	0.4

Note: some students selected more than one disorder

Table 3. *Frequencies and Percentages for Specific Medical and Learning Conditions Selected by Food Insecure Students (n = 166)*

Disorder Category		
Psychiatric Disorders	**n**	**%**
Depression	61	24.7
Generalized Anxiety Disorder	46	18.6
Panic Disorder	25	10.1
Social Anxiety Disorder	20	8.1
Post-Traumatic Stress Disorders	14	5.7
Bipolar Disorder	8	3.2
Binge Eating Disorders	8	3.2
Alcohol Addiction	6	2.4
Obsessive Compulsive Disorder	5	2.0
Anorexia Nervosa	4	1.6
Body Dysmorphic Disorder	4	1.6
Borderline Personality Disorder	4	1.6
Phobias	4	1.6
Drug Addiction	3	1.2
Bulimia Nervosa	2	0.8

Table 3. *Frequencies and Percentages for Specific Medical and Learning Conditions Selected by Food Insecure Students (n = 166) (continued)*

Disorder Category		
Gastrointestinal Disorders	**n**	**%**
Acid Reflux	39	15.8
Lactose Intolerance	21	8.5
Frequent Nausea	11	4.5
Frequent Constipation	9	3.6
Frequent Abdominal Cramps	8	3.2
Indigestion	8	3.2
Irritable Bowel Syndrome with Constipation	8	3.2
Frequent Diarrhea	7	2.8
Gallbladder Disorders	7	2.8
Irritable Bowel Syndrome with Diarrhea	6	2.4
Ulcers	5	2.0
Inflammatory Bowel Disease	3	1.2
Neurological Disorders		
Migraine Headaches	22	8.9
Attention Deficit Hyperactivity Disorder	22	8.9
Attention Deficit Disorder	16	6.5
Traumatic Brain Injury	2	0.8
Seizure Disorder	2	0.8
Epilepsy	2	0.8
Musculoskeletal Disorders		
Back Pain	34	13.8
Tendinitis	9	3.6
Carpel Tunnel Syndrome	7	2.8
Bone Fractures	5	2.0
Arthritis	4	1.6
Rheumatoid Arthritis	2	0.8
Tennis Elbow	1	0.4

Table 3. *Frequencies and Percentages for Specific Medical and Learning Conditions Selected by Food Insecure Students (n = 166) (continued)*

Disorder Category		
Overweight/Obesity	**n**	**%**
Overweight	21	8.5
Obese	10	4.0
Pulmonary Disorders		
Asthma	16	6.5
Hematology Disorders		
Anemia	18	7.3
Immunological Disorders		
Milk Allergy	7	2.8
Nut Allergy	3	1.2
Fish/Seafood Allergy	2	0.8
Celiac Disease	1	0.4
Soy Allergy	1	0.4
Cardiovascular Disorders		
Hypertension	7	2.8
High Blood Cholesterol	5	2.0
Endocrine Disorders		
Poly Cystic Ovarian Syndrome	7	2.8
Type 2 Diabetes	3	1.2
Type 1 Diabetes	2	0.8
Learning Disorders		
Dyslexia	5	2.0
Auditory Process Disorder	1	0.4
Dyspraxia	1	0.4
Executive Functioning Disorder	1	0.4
Visual Perceptual Motor Deficit	1	0.4
Autism Spectrum Disorders		
Asperger Syndrome	1	0.4
Autism	1	0.4
Other Disorders		
Visually Impaired	5	2.0
Vertigo	2	0.8
Hearing Impaired	2	0.8
Chronic Fatigue Syndrome	1	0.4
Cancer	1	0.4

Note: Some students selected more than one disorder

4.3 Correlates of Food Insecurity Among Students with Medical and Learning Disorders

Demographic and Health Correlates

Column 2 in Table 1 profiles the 166 (67.2%) of the 247 food insecure students with one or more medical and/or learning disorders. In summary, about one-third of these students were low food secure and about two-thirds were very low food secure. Approximately 20% were males, 70% females, with the remaining students opting not to disclose. Additionally, about 75% identified as non-Hispanic white, 65% held one or more part-time jobs, and approximately 70% were financial aid recipients. Correlational analyses revealed no significant associations either between the students' AFSSM scores and their personal monthly incomes ($r = .021$, $p = 0.797$) or their family yearly incomes ($r = -0.097$, $p = 0.243$), suggesting that the students' food insecurity was not strongly influenced by income. About 65% of these students lived off-campus and 20% lived on-campus. Nearly 50% perceived their health as "good" or "excellent" and about 40% as "fair" or "poor."

Academic Correlates

The mean grade point average (GPA) for the food insecure students with disorders was 3.34 (± 0.50, range 1.20 to 4.00). A significant negative correlation emerged between the students' AFSSM scores and their GPA ($r = -0.201$, $p < 0.05$), such that as the students' food insecurity became more severe their academic performance progressively worsened. Their mean score on the Academic Progress Scale (APS) was 12.54 points (± 2.40, range 5 to 16) out of a possible 16 points. A significant negative correlation was found between the students' AFSSM scores and their scores on the APS ($r = -0.195$, $p < 0.05$), suggesting that as the students' food insecurity became more severe their academic progress also declined.

Coping Strategies for Accessing Food

The mean score on the 28-item Coping Strategies Scale (CSS) earned by the food insecure students with disorders was 56.02 points (±11.62, range 14 to 97) out of a possible 112 points, with a higher score reflecting more frequent use of coping strategies. There was a significant positive correlation between the students' AFSSM scores and their scores on the CSS (r = .449, p < 0.01), such that the students experiencing more severe food insecurity used coping strategies more often. Table 4 shows the frequency counts and percentages for the 28 coping strategies, ranked in descending order according to the combined "sometimes" and "often" response options. The three strategies receiving the greatest number of these responses were: "brought food back to school after visiting family, friends, significant others, etc." (n = 151, 90.9%), "ate less healthy foods to eat more" (n = 129, 77.7%), and "ate smaller meals/portions" (n = 124, 74.7%). The three strategies receiving the greatest number of combined "never" and "seldom" responses were: "stole money to buy food" (n = 162, 97.6%), "participated in federal or state food assistance program" (n = 160, 96.4%), and "sold recreational or prescription drugs" (n = 160, 96.4%).

Table 4. *Coping Strategies for Accessing Food Used by Food Insecure Students with Disorders (n = 166) Ranked According to the Combined "Sometimes" and "Often" Response Options*

Strategy	Sometimes/Often		Never/Seldom	
	n	%	n	%
Brought food back to school	151	90.9	14	8.4
Ate less healthy foods to eat more	129	77.7	14	22.3
Ate smaller meals/portions	124	74.7	41	24.7
Planned menus	122	73.5	43	25.9
Stretched leftovers	109	65.6	56	33.7
Borrowed money from family or friends	105	63.2	60	36.2
Shared grocery and/or meal costs	102	61.4	64	38.6
Attended on-campus or community functions where there was free food	101	60.9	63	38.0
Ate more than normal when food was plentiful	97	58.4	65	39.1
Cut out food coupons	84	50.6	80	48.2
Held one or more jobs at the same time	79	47.6	86	51.8
Used a credit card to buy food	79	47.6	86	51.8
Accessed free food at food-related job	69	41.6	96	57.9
Took leftover food home from on-campus dining hall	47	28.3	117	70.4
Used less utilities	46	27.7	118	71.1
Sold personal possessions	44	26.5	121	72.9
Ate meals where you "pay what you can"	27	16.2	138	83.2
Attended free meal events in the community	25	15.0	141	85.0
Sold textbooks	23	13.8	140	84.3
Decreased medication dose or skipped medical appointments	16	9.6	149	89.7
Participated in a paid research study/clinical trial	15	12.0	150	90.4
Accessed food from a food pantry	14	8.4	151	90.9
Took fewer classes	8	4.8	156	94.0
Sold your blood/plasma	7	4.2	158	95.2
Dumpster Diving	6	3.6	158	95.2
Participated in federal or state food assistance program	5	3.0	160	96.4
Sold recreational or prescription drugs	5	3.0	160	96.4
Stole money	3	1.8	162	97.6

Note: Some students selected more than one strategy

The 28 coping strategies were assigned to four subscales based on common themes.

Table 5 shows the mean subscale scores (SD) and ranges earned by the 166 food insecure

students with disorders on these four subscales. The students earned the highest mean score

on the Food Access subscale (22.87 points ± 5.44) and the lowest score on the Selling

subscale (5.45 points ± 1.81).

Table 5. *Mean Scores on Coping Strategies Subscales Earned by Food Insecure Students with Disorders (n = 166)*

Coping Strategies Scale (28 items, possible range 28-122)		
Subscale	**Mean±SD**	**Range**
Food Access **(11 items, possible range 11-44)**	**23.87±5.44**	**11.00 – 38.00**
Ate smaller meals/portions		
Stretched leftovers		
Ate more than normal when food was plentiful		
Ate less healthy foods to eat more		
Accessed free food at food-related job		
Dumpster Diving		
Took leftover food home from on-campus dining hall		
Held one or more jobs at the same time		
Used a credit card to buy food		
Participated in a paid research study/clinical trial		
Stole money		
Saving **(6 items, possible range 6–24)**	**12.33±3.40**	**6.00 – 24.00**
Took fewer classes		
Used less utilities		
Planned menus		
Cut out food coupons		
Decreased medication dose or skipped medical appointments		
Shared grocery and/or meal costs		

Table 5. *Mean Scores on Coping Strategies Subscales Earned by Food Insecure Students with Disorders (n = 166) (continued)*

Coping Strategies Scale (28 items, possible range 28-122) Food Insecure Students with Disorders		
Subscale	**Mean±SD**	**Range**
Selling (4 items, possible range 4-16)	5.45±1.81	4.00 – 11.00
Sold textbooks		
Sold personal possessions		
Sold your blood/plasma		
Sold recreational or prescription drugs		
Social Support (6 items, possible range 6-24)	14.40±3.27	6.00 – 25.00
Borrowed money from family or		
Brought food back to school		
Attended on-campus or community functions here there was free food		
Ate meals at places where you can "pay what you can"		
Accessed food from a food pantry		
Attended free meal events in the community		
Participated in WIC/SNAP		

Money Expenditure Behaviors

The mean score on the 15-item Money Expenditure Scale (MES) earned by the food insecure students with disorders was 29.73 points (±5.28, range 7.00 to 44.00) out of a possible 64 points. No significant correlation emerged between the students' AFSSM and MES scores (r = 0.032, p = 0.685), suggesting that the students' spending habits on non-food items did not strongly impact their extent of food insecurity. Table 6 shows the frequency counts and percentages for the 15 MES items, ranked in descending order according to the combined "sometimes" and "often" response options. The three items receiving the greatest number of these responses were: "gasoline" (n = 125, 75.3%), "personal hygiene items e.g., soap, deodorant, toothpaste, etc." (n = 123, 74.1%), and "personal items e.g., clothes, makeup, etc." (n = 73, 44.0%). The three money expenditure items receiving the greatest

number of "never/seldom" responses were: "tattoos" (n = 157, 94.6%), "cigarettes" (n = 149, 89.7%), and "public transportation" (n = 147, 88.5%).

The 15 MES items were assigned to four subscales based on their focus. Table 7 shows the mean scores (SD) and ranges for each subscale. The students earned the highest mean score on the Medical Expenses subscale (9.54 points ± 3.33) and the lowest score on the Substance Use subscale (4.87 points ± 1.69).

Table 6. *Frequency of Spending on Items from the Money Expenditure Scale by Food Insecure Students with Disorders (n = 166) Ranked in Descending Order According to the combined "Sometimes" and "Often" Response Options*

Item	Sometimes/Often		Never/Seldom	
	n	%	n	%
Gasoline	125	75.3	37	22.3
Personal hygiene items	123	74.1	38	22.9
Personal items	73	44.0	88	53.0
Prescribed medications	68	41.0	93	56.0
Over-the-Counter medications	67	40.4	94	56.7
Alcohol	60	36.1	102	61.4
Health care appointments	55	33.1	106	63.8
Car repairs	41	24.7	119	71.7
Entertainment	39	23.5	122	73.5
Medical devices and equipment	18	10.8	143	86.2
Recreational drugs	17	10.2	144	86.8
Medical supplies	16	9.6	145	87.4
Public transportation	13	7.8	147	88.5
Cigarettes	9	5.4	149	89.7
Tattoos	3	1.8	157	94.6

Note: Some students selected more than one item

Table 7. *Mean Scores on Money Expenditure Subscales for Food Insecure Students with Disorders (n = 166)*

Money Expenditure Scale (15 items, possible range 1-64)		
Subscale	**Mean±SD**	**Range**
Substance Use **(3 items, possible range 3-12)**	**4.87±1.69**	**3.00 – 10.00**
Alcohol		
Cigarettes		
Recreational drugs		
Medical Expenses **(5 items, possible range 5-20)**	**9.54±3.33**	**5.00 – 20.00**
Prescribed medications		
Over-the-counter medications		
Medical supplies		
Health care appointments		
Medical devices and equipment		
Transportation **(3 items, possible range 3-12)**	**6.44±1.84**	**3.00 – 12.00**
Car repairs		
Gasoline		
Public transportation		
Personal Concerns **(4 items, possible range 4-16)**	**8.94±1.81**	**5.00 – 15.00**
Personal items		
Personal hygiene items		
Tattoos		
Entertainment		

Perceived Barriers for Adequate Food Access

Tables 8 and 9 show the barrier subscales and the specific barriers for adequate food access for the on and off-campus locations, respectively, selected by the food insecure students with disorders. The most frequently selected barriers at on-campus locations were: "my meal plan runs out" (n = 17, 10.2%), "foods are not always healthy/nutritious" (n = 15, 9.0%), and "available foods do not taste good to me" (n = 14, 8.4%). The three barriers at off-campus locations were: "I feel overwhelmed/stressed planning meals or making food choices" (n = 21, 12.7%), "food preparation is inconvenient" (n = 16, 9.6%), and "I don't have time to purchase food" (n = 11, 6.6%). There was a significant positive correlation between the students' AFSSM scores and the number of perceived barriers identified both on

and off-campus (r = .260, p < 0.05), such that those students with more severe food

insecurity perceived a greater number of barriers to accessing food at on and off-campus

locations.

Table 8. *Perceived Barriers for Adequate Food Access at On-Campus Locations Selected by Food Insecure Students with Disorders (n = 166) Ranked in Descending Order*

Subscale	n	%
Knowledge		
I don't know where to get information about food ingredients	5	3.0
I don't know how to ask for help	5	3.0
I don't know where to find places to get food	2	1.2
I don't have food preparation skills	1	0.6
Available food is not familiar to me	1	0.6
Affective		
I feel overwhelmed/stressed planning meals or making food choices	5	3.0
I feel embarrassed asking for help to access food	4	2.4
I am not interested/motivated to access food	3	1.8
Food Access		
Foods are not always healthy/nutritious	15	9.0
I can't find the foods I like	11	6.6
I have safety concerns	5	3.0
I need assistance accessing or preparing food	4	2.4
I require assistance with mobility that makes accessing food difficult	3	1.8
I don't have transportation	1	0.6
Personal Concerns		
Available foods do not taste good to me	14	8.4
Available foods do not support my special dietary needs	8	4.8
Available foods are not culturally appropriate	2	1.2
Available foods do not support my religious beliefs	1	0.6
My family doesn't want me to ask for help accessing food	1	0.6
Practical Concerns		
My meal plan runs out	17	10.2
I don't have time to eat regular meals	11	6.6
Food preparation is inconvenient	8	4.8
I don't have cooking equipment	8	4.8
I don't have enough money to purchase healthy/nutritious foods	7	4.2
I don't have time to purchase food	6	3.6

Note: some students selected more than one item

Table 9. *Perceived Barriers for Adequate Food Access at Off-Campus Locations Selected by Food Insecure Students with Disorders (n = 166) Ranked in Descending Order*

Subscale	n	%
Knowledge		
I don't have food preparation skills	8	4.8
I don't know how to ask for help	7	4.2
I don't know where to get information about food ingredients	3	1.8
I don't know where to find places to get food	3	1.8
Available food is not familiar to me	3	1.8
Affective		
I feel overwhelmed/stressed planning meals or making food choices	21	12.7
I feel embarrassed asking for help to access food	4	2.4
I am not interested/motivated to access food	3	1.8
Food Access		
Foods are not always healthy/nutritious	9	5.4
I don't have transportation	6	3.6
I have safety concerns	5	3.0
I need assistance accessing or preparing food	5	3.0
I can't find the foods I like	3	1.8
I require assistance with mobility that makes accessing food difficult	2	1.2
Personal Concerns		
Available foods do not taste good to me	3	1.8
Available foods do not support my special dietary needs	2	1.2
Available foods are not culturally appropriate	2	1.2
Available foods do not support my religious beliefs	2	1.2
My family doesn't want me to ask for help accessing food	2	1.2
Practical Concerns		
Food preparation is inconvenient	16	9.6
I don't have time to purchase food	11	6.6
I don't have enough money to purchase healthy/nutritious foods	9	5.4
I don't have time to eat regular meals	5	3.0
I don't have cooking equipment	2	1.2
My meal plan runs out	0	0.0

Note: some students selected more than one item

Social Support for Adequate Food Access

Table 10 shows the rankings, in descending order, of the sources of social support considered helpful by the food insecure students with disorders for improving their access to an adequate diet. The three sources regarded as most helpful were: "lower priced-nutritious foods at on-campus dining halls and markets" (n = 55, 33.1%), "less expensive meal plan cards" (n = 51, 30.7%), and "provide more nutritious food options at on-campus locations" (n

= 49, 29.5%). Correlational analyses revealed no significant associations between the

students' AFSSM scores and the number of sources of social support selected (r = -.077, p =

0.511), suggesting that the number remained fairly consistent over the range of AFSSM

scores.

Table 10. *Sources of Social Support for Adequate Food* Access *by Food Insecure Students with Disorders (n = 166)*

Type of Social Support	n	%
Lower priced nutritious foods at on-campus dining halls and markets	55	33.1
Less expensive meal plan cards	51	30.7
Provide more nutritious food options at on-campus locations	49	29.5
More financial aid at school	45	27.2
Provide a wider variety of food options at on-campus locations	44	26.5
Learn how to cut costs when grocery shopping	44	26.5
Learn how to budget food money for eating out	38	22.9
Learn how to make a budget for living expenses	37	22.3
Learn how to grow food	37	22.3
Make dormitory cooking equipment more accessible	35	21.1
Financial help from others	33	19.9
Learn how to eat healthy	33	19.9
Learn how to plan meals	30	18.1
Learn how to make nutritious food choices	29	17.5
Extend operation hours of on campus dining halls and markets	29	17.5
More work study job opportunities	28	16.9
Learn time management for meal planning and preparation	28	16.9
Learn how to shop for food	24	14.5
Learn how to cook	20	12.0
Provide more allergen-friendly food options and labeling information at on-campus locations	20	12.0
Provide a wider variety of food options at community food outlets	19	11.4
Provide more nutritious food options at community food outlets like grocery stores and restaurants	18	10.8
Personal assistance with shopping, preparing, and cooking food	15	9.0
Provide better transportation to community food outlets like grocery stores and restaurants	12	7.2
Learn how to follow my special diet	12	7.2
Provide better transportation to on-campus dining and food services	11	6.6
Provide more allergen-friendly food options and labeling information at community food outlets	9	5.4
Learn how to access foods that meet my cultural needs	4	2.4
Get a roommate	3	1.8

Note: Some students selected more than one source

Dietary Correlates

Correlational analyses revealed a significant negative association between the students' AFSSM scores and their daily average consumption of vegetables ($r = -0.182$, $p < 0.05$), such that as students' food insecurity became more severe, their daily average consumption of vegetables decreased considerably. No significant correlations were found between their AFSSM scores and consumption of the following: grains/cereals ($r = -0.105$, $p = 0.208$), fruits ($r = -0.038$, $p = 0.646$), meats ($r = -0.010$, $p = 0.909$), other protein foods ($r = -0.068$, $p = 0.417$), dairy foods ($r = -0.027$, $p = 0.743$), and sweets ($r = -0.011$, $p = 0.891$).

4.4 Correlates of Food Insecurity Among Students without Disorders

Demographic and Health Correlates

The third column in Table 1 characterizes of the 81 (32.8%) of the food insecure students who had no medical or learning disorders. Among these students, almost 60% had experienced low food security and 40% had experienced very low food security. In summary, about 25% were male and 40% were female, with the remaining students opting not to disclose. About 60% of these students self-classified as non-Hispanic white, 60% held one or more part-time jobs, and nearly 50% were financial aid recipients. Correlational analyses revealed no significant associations either between the students' AFSSM and their personal monthly incomes ($r = 0.062$, $p = 0.646$) or their family yearly incomes ($r = -0.085$, $p = 0.532$), suggesting that the students' food insecurity was not strongly impacted by income. About 50% of these students lived off-campus. Regarding perceived health status, nearly 50% self-classified as being in "good" or "excellent" health, while about 20% regarded their health as "fair" or "poor."

Academic Correlates

The mean GPA for the food insecure students without disorders was 3.36 (± 0.49, range 1.90 to 4.0). No significant correlation was found between the students' AFSSM scores and their GPAs, (r = -0.200, p = 0.150), suggesting that as the students' food insecurity became more severe their academic performance was not significantly impacted. Their mean score on the Academic Progress Scale (APS) was 13.02 points (±2.66, range 4 to 12) out of a possible 16 points. Correlational analyses revealed no significant association between the students' AFSSM scores and their scores on the APS (r = -0.005, p = 0.970), suggesting that their academic progress was not strongly influenced by their degree of food insecurity.

Coping Strategies for Accessing Food

The mean score on the 28-item Coping Strategies Scale (CSS) earned by the food insecure students without disorders was 53.31 points (±12.08, range 34 to 82) out of a possible 112 points, with a higher score reflecting more frequent use of coping strategies. There was a significant positive correlation between the students' AFSSM scores and their scores on the CSS, (r = .582, p < 0.01), such that the students who experienced more severe food insecurity used a greater number of coping strategies. Table 11 shows the frequency counts and percentages for the 28 coping strategies used by the food insecure students without disorders, ranked in descending order according to the combined "sometimes" and "often" responses. The three strategies receiving the greatest number of these combined responses were: "brought food back to school after visiting family, friends, significant others, etc." (n = 51, 63.0%), "ate smaller meals/portions" (n = 44,54.3%), and "planned menus" (n = 43, 53.1%). The three strategies receiving the greatest number of combined "never" and "seldom" responses were: "took fewer classes" (n = 60, 74.1%), "sold recreational or

prescription drugs" (n = 59, 72.8%), and "decreased medication dose or skipped medical

appointments" (n = 59, 72.8%).

Table 11. *Coping Strategies for Accessing Food Used by Food Insecure Students without Disorders (n = 81) Ranked in Descending Order According to the Combined "Sometimes" and "Often" Response Options*

Coping Strategies Scale Food Insecure Students without Disorders				
	Sometimes/Often		Never/Seldom	
Strategy	**n**	**%**	**n**	**%**
Brought food back to school	51	63.0	10	12.3
Ate smaller meals/portions	44	54.3	17	21.0
Planned menus	43	53.1	18	22.2
Ate less healthy foods to eat more	40	49.4	21	25.9
Stretched leftovers	38	46.9	23	28.4
Attended on-campus or community functions where there was free food	34	42.0	27	33.3
Ate more than normal when food was plentiful	33	40.7	28	34.6
Cut out food coupons	31	38.3	30	37.1
Shared grocery and/or meal costs with others	31	38.2	30	37.0
Borrowed money from family or friends	29	35.8	32	39.5
Held one or more jobs at the same time	24	29.6	37	45.7
Used a credit card to buy food	24	29.6	37	45.7
Accessed free food at food-related job	20	24.7	41	50.6
Took leftover food home from on-campus dining hall	14	17.2	47	58.0
Used less utilities	14	17.3	47	58.0

Table 11. *Coping Strategies for Accessing Food Used by Food Insecure Students without Disorders (n = 81) Ranked in Descending Order According to the Combined "Sometimes" and "Often" Response Options (continued)*

Coping Strategies Scale Food Insecure Students without Disorders				
	Sometimes/Often		**Never/Seldom**	
Strategy	**n**	**%**	**n**	**%**
Attended free meal events in the community	12	14.8	49	60.5
Ate meals at places where you can "pay what you can"	10	12.3	51	63.0
Sold personal possessions	8	9.8	53	65.4
Accessed food from food pantry	8	9.9	53	65.4
Dumpster Diving	5	6.2	56	69.1
Participated in a paid research study/clinical trial	5	6.1	56	69.1
Stole money	3	3.7	56	69.1
Sold textbooks	3	3.7	58	71.6
Sold your blood/plasma	3	3.7	57	70.4
Participated in federal or state food assistance program	3	3.7	58	71.6
Decreased medication dose or skipped medical appointments	2	2.5	59	72.8
Sold recreational or prescription drugs	2	2.5	59	72.9
Took fewer classes	1	1.2	60	74.1

Note: Some students selected more than one strategy

The 28 coping strategies were assigned to four subscales based on their focus. Table 12 shows the mean scores (SD) and ranges earned by the food insecure students without disorders on these subscales. The students earned the highest mean score on the Food Access subscale (22.67 points ± 6.09) and the lowest score on the Selling subscale (4.87 points ± 1.55).

Table 12. *Mean Scores on Coping Strategies Subscales Earned by Food Insecure Students without Disorders (n = 81)*

Coping Strategies Scale (28 items, possible range 28-112)		
Subscale	**Mean±SD**	**Range**
Food Access (11 items, possible range 11-44)	**22.67±6.09**	**13.00 – 36.00**
Ate smaller meals/portions to make the food last longer		
Stretched leftovers		
Ate more than normal when food was plentiful		
Ate less healthy foods to eat more		
Accessed free food at food-related job		
Dumpster Diving		
Took leftover food home from on-campus dining hall		
Held one or more jobs at the same time to have more money to buy food		
Used a credit card to buy food		
Participated in a paid research study/clinical trial		
Stole money		
Saving (6 items, possible range 6–24)	**11.84±3.19**	**6.00 – 18.00**
Took fewer classes		
Used less utilities		
Planned menus		
Cut out food coupons		
Decreased medication dose or skipped medical appointments		
Shared grocery and/or meal costs with others		
Selling (4 items, possible range 4-16)	**4.87±1.55**	**4.00 – 10.00**
Sold textbooks		
Sold personal possessions		
Sold your blood/plasma		
Sold recreational or prescription drugs		

Table 12. *Mean Scores on Coping Strategies Subscales Earned by Food Insecure Students without Disorders (n = 81) (continued)*

Coping Strategies Scale (28 items, possible range 28-112)		
Subscale	**Mean±SD**	**Range**
Social Support **(6 items, possible range 6-24)**	**13.93±3.54**	**8.00 – 23.00**
Borrowed money from family or friends		
Brought food back to school		
Attended on-campus or community functions where there was free food		
Ate meals at places where you "pay what you can"		
Accessed food from a food pantry		
Attended free meal events in the community		
Participated in WIC/SNAP		

Money Expenditure Behaviors

The mean score on the 15-item Money Expenditure Scale (MES) earned by the food insecure students without disorders was 27.08 points (±4.49, range 15 to 38), out of a possible 64 points. No significant correlation was found between the students' AFSSM and MES scores, (r = -0.130, p = 0.321), suggesting that their money spending behaviors for non-food items did not have a strong influence on their food insecurity.

Table 13 shows the frequency counts and percentages for the 15 MES items, ranked in descending order according to the combined "sometimes" and "often" responses, selected by the food insecure students without disorders. The three items receiving the greatest number of these combined responses were: "personal hygiene items" (n = 50, 61.8%), "gasoline" (n = 46, 56.8%), and "personal items" (n = 32, 39.5%). The three items receiving the greatest number of combined "never" and "seldom" responses were: "medical supplies" (n = 60, 74.1%), "tattoos" (n = 59, 72.8%), and "cigarettes" (n = 58, 71.6%).

Table 13. *Frequency Counts and Percentages for Items on the Money Expenditure Scale (MES) for the Food Insecure Students without Disorders (n = 81), Ranked by Combining "Sometimes" and "Often" Response Options*

Item	Sometimes/Often		Never/Seldom	
	n	%	n	%
Personal Hygiene Items	50	61.8	10	12.3
Gasoline	46	56.8	14	17.2
Personal Items	32	39.5	28	34.5
Alcohol	26	32.1	34	42.0
Entertainment	22	27.2	38	46.9
Car Repairs	14	17.2	46	56.8
Prescribed Medications	8	9.9	52	64.2
Over-the-Counter Medications	8	9.9	52	64.2
Recreational Drugs	7	8.6	52	64.2
Health Care Appointments	5	6.2	55	67.9
Medical Devices and Equipment	5	6.2	55	67.9
Public Transportation	5	6.2	55	67.9
Cigarettes	1	1.2	58	71.6
Tattoos	1	1.2	59	72.8
Medical Supplies	0	0	60	74.1

Note: Some students selected more than one item

The 15 MES items were assigned to four subscales based on their focus. Table 14 shows the mean scores (SD) and ranges earned by the food insecure students without disorders. The highest mean score was earned on the Personal Concerns subscale (9.11 points ± 1.82) and the lowest score was earned on the Substance Use subscale (4.80 points ± 1.50).

Table 14. *Mean Scores on Money Expenditure Subscales Earned by Food Insecure Students without Disorders (n= 81)*

Money Expenditure Scale (15 items, possible range 1-64)		
Subscale	**Mean±SD**	**Range**
Substance Use **(3 items, possible range 3-12)**	**4.8±1.50**	**3.00 – 9.00**
Alcohol		
Cigarettes		
Recreational drugs		
Medical Expenses **(5 items, possible range 5-20)**	**6.92±2.03**	**5.00 – 14.00**
Prescribed medications		
Over-the-counter medications		
Medical supplies		
Health care appointments		
Medical devices and equipment		
Transportation **(3 items, possible range 3-12)**	**6.30±1.68**	**3.00 – 10.00**
Car repairs		
Gasoline		
Public transportation		
Personal Concerns **(4 items, possible range 4-16)**	**9.11±1.82**	**4.00 – 13.00**
Personal items		
Personal hygiene items		
Tattoos		
Entertainment		

Perceived Barriers for Adequate Food Access

Tables 15 and 16 show the barrier subscales and the specific perceived barriers to adequate food access for the on and off-campus locations respectively, selected by the food insecure students without disorders. The most frequently selected barriers at on-campus locations were: "my meal plan runs out" (n = 10, 12.3%), "foods are not always healthy/nutritious" (n = 6, 7.4%), and "food preparation is inconvenient" (n = 6, 7.4%). The most frequently selected barriers at off-campus locations were: "I don't know how to ask for help" (n = 7, 8.6%), "food preparation is inconvenient" (n = 6, 7.4%), and "I feel

overwhelmed/stressed planning meals or making food choices" (n = 6, 7.4%). There were no

significant correlations between the students' AFSSM scores and the number of barriers

identified for either the on or off-campus locations, (r = 0.243, p = 0.264), suggesting that

their food insecurity was not strongly influenced by the number of barriers to accessing food

at either location.

Table 15. *Perceived Barriers to Adequate Food Access at On-Campus Locations Selected by Food Insecure Students without Disorders (n = 81)*

Subscale	n	%
Knowledge		
I don't know how to ask for help	3	3.7
I don't know where to get information about food ingredients	2	2.5
I don't know where to find places to get food	1	1.2
I don't have food preparation skills	1	1.2
Available food is not familiar to me	1	1.2
Affective		
I feel overwhelmed/stressed planning meals or making food choices	3	3.7
I feel embarrassed asking for help to access food	2	2.5
I am not interested/motivated to access food	1	1.2
Food Access		
Foods are not always healthy/nutritious	6	7.4
I can't find the foods I like	5	6.2
I have safety concerns	1	1.2
I need assistance accessing or preparing food	1	1.2
I require assistance with mobility that makes accessing food difficult	1	1.2
I don't have transportation	1	1.2
Personal Concerns		
Available foods do not taste good to me	5	6.2
Available foods do not support my special dietary needs	3	3.7
Available foods are not culturally appropriate	1	1.2
Available foods do not support my religious beliefs	1	1.2
My family doesn't want me to ask for help accessing food	0	0
Practical Concerns		
My meal plan runs out	10	12.3
Food preparation is inconvenient	6	7.4
I don't have enough money to purchase health/nutritious foods	5	6.2
I don't have time to purchase food	4	4.9
I don't have cooking equipment	3	3.7
I don't have time to eat regular meals	2	2.5

Note: Some students selected more than one barrier

Table 16. *Perceived Barriers to Adequate Food Access at Off-Campus Locations Selected by Food Insecure Students without Disorders (n = 81)*

Subscale	n	%
Knowledge		
I don't know how to ask for help	7	8.6
I don't know where to get information about food ingredients	2	2.5
Available food is not familiar to me	2	2.5
I don't know where to find places to get food	1	1.2
I don't have food preparation skills	1	1.2
Affective		
I feel overwhelmed/stressed planning meals or making food choices	6	7.4
I feel embarrassed asking for help to access food	2	2.5
I am not interested/motivated to access food	2	2.5
Food Access		
Foods are not always healthy/nutritious	3	3.7
I need assistance accessing or preparing food	2	2.5
I require assistance with mobility that makes accessing food difficult	2	2.5
I don't have transportation	2	2.5
I can't find the foods I like	1	1.2
I have safety concerns	1	1.2
Personal Concerns		
Available foods do not taste good to me	1	1.2
Available foods do not support my special dietary needs	1	1.2
Available foods are not culturally appropriate	1	1.2
Available foods do not support my religious beliefs	1	1.2
My family doesn't want me to ask for help accessing food	1	1.2
Practical Concerns		
Food preparation is inconvenient	6	7.4
I don't have time to purchase food	5	6.2
I don't have time to eat regular meals	2	2.5
I don't have enough money to purchase healthy/nutritious foods	2	2.5
I don't have cooking equipment	2	2.5
My meal plan runs out	1	1.2

Note: Some students selected more than one barrier

Social Support for Adequate Food Access

Table 17 ranks, in descending order, the sources of social support considered helpful by the food insecure students without disorders for improving their food access. The three sources regarded most helpful were: "less expensive meal plan cards" (n = 22, 27.2%), "lower priced nutritious foods at on-campus dining halls and markets" (n = 21, 25.9%), and "provide a wider variety of food options at on-campus locations" (n = 17, 21.0%).

Table 17. *Sources of Social Support for Adequate Food Access by Food Insecure Students Without Disorders (n = 81)*

Type of Social Support	n	%
Less expensive meal plan cards	22	27.2
Lower priced nutritious foods at on-campus dining halls and markets	21	25.9
Provide a wider variety of food options at on-campus locations	17	21.0
Provide more nutritious food options at on-campus locations	16	19.8
Learn how to cut costs when grocery shopping	15	18.5
More financial aid at school	13	16.0
Financial help from others	13	16.0
Learn how to make a budget for living expenses	12	14.8
Learn how to eat healthy	12	14.8
Learn how to budget food money for eating out	11	13.6
Make dormitory cooking equipment more accessible	11	13.6
Learn how to make nutritious food choices	11	13.6
Provide more nutritious food options at community food outlets	11	13.6
Learn how to plan meals	10	12.3
More work study job opportunities	10	12.3
Provide a wider variety of food options at community food outlets	10	12.3
Learn how to grow food	9	11.1
Extend operation hours of on campus dining halls and markets	8	9.9
Learn how to shop for food	8	9.9
Learn how to cook	7	8.6
Learn time management for meal planning and preparation	6	7.4
Provide better transportation to community food outlets like grocery stores and restaurants	4	4.9
Provide more allergen-friendly food options and labeling information at on-campus locations	3	3.7
Personal assistance with shopping, preparing, and cooking food	3	3.7
Learn how to follow my special diet	3	3.7
Provide more allergen-friendly food options and labeling information at community food outlets like grocery stores and restaurants	2	2.5
Learn how to access foods that meet my cultural needs	2	2.5
Get a roommate	1	1.2
Provide better transportation to on-campus dining and food services	0	0

Note: Some students selected more than one source

Dietary Correlates

Correlational analyses revealed a significant negative association for the food insecure students without disorders between their AFSSM scores and their consumption of fruits, dairy foods, and sweets (in all cases r = -0.285, p < 0.05), suggesting that as the students' food insecurity worsened, the consumption of these items decreased. No significant correlations were found between the students' AFSSM scores and their consumption of: grains/cereals (r = -0.117, p = 0.386), vegetables (r = -0.135, p = 0.316), meats (r = -0.206, p = 0.123), and other protein foods (r = -0.189, p = 0.160).

4.5 Comparisons of Correlates for Food Insecurity Among Students with and without Medical and Learning Disorders

Demographic and Health Correlates

The second and third columns in Table 1 compare the demographic and health characteristics of the food insecure students with and without medical and learning disorders, and Table 1-A compares proportions of these two groups based on Chi-square analyses. The prevalence of food insecurity was significantly higher among the students with than without disorders, respectively (n = 166, 67.2% vs. n = 81, 32.8%, χ^2 (1) = 5.433, p < 0.05). Additionally, Chi-square analyses showed that a greater proportion of the students with a disorder experienced more severe food insecurity (χ^2 (1) = 8.907, p < 0.05). There was no significant difference in food insecurity rates among the students with and without learning disorders.

Gender-based comparisons indicated that, among the students with disorders, 33 (19.9%) were males and 115 (69.3%) were females, while among the students without disorders 22 (27.2%) were males and 35 (43.2%) were females. The proportions of males with and without disorders, respectively, were 33 (19.9%) and 22 (27.2%), while the

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corresponding findings for the females, respectively, were 115 (69.3%) and 35 (43.2%). These findings suggest an overrepresentation of females in the overall sample (χ^2 (2) = 7.17, p < 0.05). Independent samples t-test revealed no significant difference in the mean age of the students with and without disorders, respectively (21.58 ±2.881 years vs. 21.05 years ±2.291, t [206] = 1.244, p = 0.215). Regarding residence, chi-square analysis comparing proportions of food insecure students living on and off-campus found no significant differences in food insecurity rates (χ^2 (1) = 0.21, p = 0.650). Comparisons of food insecurity rates based on academic classification indicated that the rate among freshmen/sophomores with disorders was significantly higher than that of those without disorders, respectively (n = 42, 70% vs. n = 18, 30%, χ^2 (1) = 4.898, p < 0.05). Likewise, the rate among juniors/seniors/graduate students with disorders was significantly higher than that among those students without disorders (n = 105, 56% vs. n =39, 21%, (χ^2(4) = 15.421, p < 0.05).

Comparisons of food insecurity rates based on health and cooking variables indicated that there was no significant difference in rates among the students with and without disorders based on BMI (χ^2 (3) = 2.848, p = 0.416). Additionally, there were no significant differences based on average personal monthly incomes (t [202] = 0.727, p = 0.468) or yearly family incomes (t [200] = 0.725, p = 0.469). There were also no significant differences in food insecurity rates between the proportions of food insecure students with and without disorders, respectively, who rated their perceived health as "fair" or "poor," (χ^2 (1) = 1.356, p = 0.244). However, a significant difference was found in the rates of food insecurity among the proportions of students with and without disorders, respectively, who perceived their health as "good" or "excellent," (χ^2 (2) = 18.271, p < 0.01).

Table 18 shows the terms selected most often by the food insecure students with and without disorders to describe their food situation. Those most often selected by the students with disorders were "anxious" (n = 64, 38.6%), "frustrated" (n = 56, 33.7%), and "worried" (n = 47, 28.3%), while those selected most often by the students without disorders were "insecure" (n = 15, 18.5%), "frustrated" (n = 13, 16.0%), and "Worried" (n = 11, 13.6%).

Table 18. *Terms Selected by Food Insecure Students with Disorders (n = 166) and Food Insecure Students without Disorders (n = 81) to Describe Their Current Food Access Ranked in Descending order*

Emotional Responses					
Food Insecure Students with Disorders			**Food Insecure Students without Disorders**		
Emotions	**n**	**%**	**Emotions**	**n**	**%**
Negative emotions					
Anxious	64	38.6	Insecure	15	18.5
Frustrated	56	33.7	Frustrated	13	16.0
Worried	47	28.3	Worried	11	13.6
Insecure	41	24.7	Anxious	10	12.3
Embarrassed	30	18.1	Guilty	7	8.6
Guilty	20	12.0	Deprived	7	8.6
Deprived	13	7.8	Helpless	6	7.4
Ashamed	13	7.8	Embarrassed	5	6.2
Helpless	11	6.6	Ashamed	5	6.2
Resentful	9	5.4	Humiliated	4	4.9
Humiliated	8	4.8	Sad	4	4.9
Sad	7	4.2	Angry	2	2.5
Angry	7	4.2	Resentful	1	1.2
Positive emotions					
Fine/OK	84	50.6	Fine/OK	27	33.3
Satisfied	26	15.7	Satisfied	20	24.7
Secure	22	13.3	Secure	11	13.6
Pleased	12	7.2	Pleased	7	8.6

Note: Some students selected more than one term

Academic Correlates

The mean GPA for the food insecure students with disorders was 3.34 (±0.50, range 1.20 to 4.00), while that for the students without disorders was 3.36 (±0.49, range 1.80 to 4.00), indicating no significant difference between the mean GPAs of the two groups (*t* [191] = 0.144, p = 0.819). Likewise, there was no significant difference between the mean APS

scores of the two groups (12.54 points ± 2.40 vs. 13.02 points ±2.66, t [207] = 0.237, p =

0.214). However, a chi-square analysis showed a significant difference in the proportions of

food insecure students with and without disorders on the Academic Progress Scale variable,

"attention span in class," (χ^2 (3) = 10.560, p < 0.05) (Table 19).

Table 19. *Self-Ratings on Variables from the Academic Progress Scale Among Food Insecure Students with Disorders (n = 166) and Food Insecure Students Without Disorders (n = 81)*

Academic Progress Scale						
	Food Insecure Students with Disorders		Food Insecure Students without Disorders		χ^2	p – value
Variable	n	%	n	%		
Overall Progress					1.451	0.694
Poor/fair	21	13.8	7	12.3		
Good/excellent	131	86.2	50	87.7		
Class Attendance					2.535	0.469
Poor/fair	25	16.4	5	8.8		
Good/excellent	127	83.6	52	91.2		
Attention Span					10.560	<0.05*
Poor/fair	60	39.4	11	19.3		
Good/excellent	92	60.5	46	80.7		
Understanding of Concepts					0.855	0.836
Poor/fair	21	13.8	7	12.3		
Good/Excellent	131	86.2	78	87.7		

* level of significance was p < 0.05

Coping Strategies for Accessing Food

The strategies from the CSS most frequently used "sometimes/often" by the food

insecure students with disorders were: "brought food back to school after visiting family,

friends, and/or significant others" (n = 151, 90.9%), "ate less healthy foods to eat more" (n =

151, 90.9%), and "ate smaller meals/portions" (n = 124, 74.7%), while those most frequently

used "sometimes/often" by the students without disorders were: "brought food back to school

after visiting family, friends, and/or significant others" (n = 51, 63.0%), "ate smaller

meals/portions" (n = 44, 54.3%), and "planned menus" (n = 43, 53.1%) (Tables 4 and 11).

An independent samples t-test revealed no significant difference between the mean CSS

scores of the two groups *(t* [225] = - 1.539, p = 0.125). The only significant difference

between the subscale scores for the two groups occurred on the Selling subscale, such that

the students with disorders earned a higher score (1.37 points ±0.45 vs. 1.22 ±0.38 points, *t*

[224] = -2.250, p < 0.05).

Money Expenditure Behaviors

The three nonfood items purchased "sometimes/often" by the food insecure students

with disorders were: "gasoline" (n = 125, 75.3%), "personal hygiene items" (n = 123,

74.1%), and "personal items" (n = 73, 44.0%), while those purchased "sometimes/often" by

those without disorders were: "personal hygiene items" (n = 50, 61.8%), "gasoline" (n = 46,

56.8%), and "personal items" (n = 32, 39.5%) (Tables 7 and 14). Comparison of the overall

mean MES scores of the two groups indicated that those with disorders scored significantly

higher than those without disorders (1.98 points ±0.35 vs. 1.80 points ±0.29, *t* [220] = 2.740,

p <0.01). The students with disorders earned a significantly higher mean score on the

Medical Expenses subscale (1.91 points ±0.66 vs. 1.38 points ±0.41, *t* [220] = -5.710, p <

0.01). No other significant differences were found between MES subscale scores for the two

groups. The significant difference between the two groups on the Medical Expenses subscale

was supported by further comparisons of the proportions of the students based on their

spending behaviors for items within this subscale. Accordingly, findings indicated significant

differences between those who "sometimes/often" spent money on the following items:

prescribed medications (χ^2 (1) = 18.342, p < 0.01), over-the-counter medications (χ^2 (1) =

15.126, p < 0.01), medical supplies (χ^2 (1) = 6.323, p < 0.05), and health care appointments

(χ^2 (1) = 17. 070, p < 0.01), suggesting that the students with disorders spent considerably more than the students without disorders on medical related expenses.

Perceived Barriers for Adequate Food Access

The three barriers selected most often by the students with disorders at on-campus locations were: "my meal plan runs out" (n = 17, 10.2%), "foods are not always healthy/nutritious" (n = 15, 9.0%), and "available foods do not taste good to me" (n = 14, 8.4%), while those selected most frequently by the students without disorders were: "my meal plan runs out" (n = 10, 12.3%), "food preparation is inconvenient" (n = 6, 7.4%), and "foods are not always healthy/nutritious" (n = 6, 7.4%) (Tables 9, 16). Furthermore, the top three barriers selected most often by the food insecure students with disorders at off-campus locations were: "I feel overwhelmed/stressed planning meals or making food choices" (n = 21, 12.7%), "food preparation is inconvenient" (n = 16, 9.6%), and "I don't have time to purchase food" (n = 11, 6.6%), while the barriers identified most often by those without disorders were: "I don't know how to ask for help" (n = 7, 8.6%), "I feel overwhelmed/stressed planning meals or making food choices" (n = 6, 7.4%), and "food preparation is inconvenient" (n = 6, 7.4%) (Tables 10 and 17). There was no significant difference between the mean scores for all barrier subscales for the combined on and off-campus locations between the two groups (t [78] = -0.003, p = 0.998).

Social Support for Adequate Food Access

The three types of social support selected most frequently as helpful for improving food access by the food insecure students with disorders were: "lower priced nutritious foods at on-campus dining halls and markets" (n = 55, 33.1%), "less expensive meal plan cards" (n = 51, 30.7%), and "provide more nutritious food options at on-campus locations" (n = 49,

29.5%), while those selected most frequently by the students without disorders were: "less expensive meal plan cards" (n = 22, 27.2%), "lower priced nutritious foods at on-campus dining halls and markets" (n = 21, 25.9%), and "provide a wider variety of food options at on-campus locations" (n = 17, 21.0%) (Tables 11 and 18). There was no significant difference in the average number of sources of social support identified by the students with and without disorders, (t [103] = -1.275, p = 0.205).

Dietary Correlates

Regarding frequency of food preparation, 136 (81.9%) of the food insecure students with disorders cooked for self/others "sometimes/often" compared to 53 (65%) of those without disorders. The findings regarding self-rated cooking skills revealed no significant difference between the proportions of food insecure students with and without disorders who rated their skills as "excellent/good" (n = 95, 57.2% vs n = 41, 50.6%), respectively (χ^2 (1) = 0.933, p = 0.334). Comparisons of food group consumption by the students with and without disorders showed the following dietary patterns:

- grains/cereals two times per day (n = 40, 24.1% vs. n = 17, 21.0%),)

- vegetables one time per day (n = 51, 30.7% vs. n = 22, 27.2%)

- fruits one time per day (n = 66, 39.8% vs. n = 20, 24.7%)

- protein foods one time per day (n = 18, 22.2% vs. n = 50, 30.1%)

- dairy foods two times per day (n = 45, 27.1% vs. n = 23, 28.4%)

- sweets one time per day (n = 58, 34.9% vs. n = 21, 25.9%)

Chi-square analysis revealed a significant difference in the proportion of food insecure students with and without disorders, respectively, regarding their desire to consume more fruits (χ^2 (1) = 9.722, p < 0.01) and vegetables (χ^2 = (1) = 15.392, p < 0.01).

Chapter Five

Discussion

5.1 Hypothesis Testing and Interpretation of Results

The prevalence of food insecurity among the 437 Appalachian State University students who participated in the present study was 56.5%, which was higher than the rate of 46.2% reported for students at the university during the spring 2016 semester (McArthur, Ball, Danek, & Holbert, 2018). As hypothesized, more severe food insecurity was associated with an increased risk of students self-reporting one or more medical or learning disorders. This finding provides preliminary evidence suggesting an increase in the prevalence and severity of food insecurity among college students with such disorders.

Previous literature has reported common demographic and lifestyle characteristics associated with college student food insecurity such as female gender (reflective of unbalanced gender distributions), off-campus residence, and upper classman (Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez, 2014; McArthur, Ball, Danek, & Holbert, 2018). Gender-based comparisons in the present study yielded a higher prevalence of food insecurity among diagnosed and undiagnosed female students. Related findings failed to support the hypothesis that males with disorders would have a significantly higher prevalence of food insecurity than females with disorders. It can be speculated that these data are a result of an overrepresentation of female students. An additional demographic characteristic that was observed among both the diagnosed and undiagnosed students was off-campus residence. Furthermore, when comparing food insecurity rates among the diagnosed students, it was observed that a significantly larger proportion of the diagnosed students resided at an off-campus location. This finding supported the hypothesis that off-campus residents with

disorders would have a significantly higher prevalence of food insecurity than on-campus residents with disorders. The living cost attributed with off-campus residence such as rent, parking expenses, and lower participation in on-campus meal plans, along with the associated costs of medical disorders, may have contributed to the high rate of food insecurity among this subgroup. Concerning the students' academic classification, findings revealed that food insecurity rates were significantly higher among freshman/sophomores with disorders than those without disorders. Similar findings were observed among the group of diagnosed juniors, seniors, and graduate students. These data supported the hypothesis that lower level students, upper level students, and graduate students with disorders would have a higher prevalence of food insecurity than lower level, upper level, and graduate students without disorders.

Investigators examining the impacts of food insecurity on college students have identified unfavorable consequences on student cognitive, academic, and psychosocial development, and an increased risk of developing an array of physical and mental health conditions (Jyoti, Frongillo, & Jones, 2005; Cook & Frank, 2008; Holden, 2010; Alaimo, Olson, & Frongillo, 2011). The food insecurity literature speculates that the connection to such detrimental repercussions may be attributed to the importance that dietary quality and food sufficiency have on health indicators (Wall-Bassett, Li, & Matthews, 2017; Farahbakhsh, Hanbazaza, Farmer, Maximova, & Willows, 2017). More specifically, the research most commonly associates college student food insecurity with depression and generalized anxiety symptomology (Bruening, Brennhofer, van Woerden, Todd, & Laska, 2016; Wall-Bassett, Li, & Matthews, 2017). The identified relationship between psychological disorders and food security status is evidenced in the literature by students'

self-identified emotional responses to their current food situation, i.e., worry and stress (Payne-Sturges, Tjaden, Caldeira, Vincent, & Arria, 2018; Frank, 2018). In higher education, emerging research suggests that psychiatric disorders may inhibit students from being successful in academic, work, and social settings (Kessler, Foster, Saunders, et al., 1995; Kessler, Walters, & Forthofer, 1998; Alaimo, Olson, & Frongillo, 2011). The findings from this thesis agree with those of other investigations such that the most common medical disorders self-reported by the food insecure students were depression and generalized anxiety disorder. However, despite the well-documented unfavorable health outcomes that affect students who are challenged with food insecurity and the additional challenges associated with medical disorders, there was no significant difference in the proportions of food insecure students with and without disorders who perceived their health as "fair" or "poor". In fact, a majority of the food insecure students in both groups perceived their health as "good" or "excellent". These data failed to support the hypothesis that a significantly greater proportion of students with disorders would rate their perceived health status as "fair/poor" than students without disorders.

Several authors have reported that food insecure students are at greater risk for compromised academic success compared to their food secure counterparts (Maroto, Snelling, & Linck, 2009). In this regard, researchers have consistently observed an inverse relationship between food insecurity and cumulative grade point average (GPA) (Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez, 2014; Raskind, Haardorfer, & Berg, 2018). Additionally, one study related poor mental health to both higher scores on the AFSSM and to lower GPA, suggesting that improvements in access to nutritious food may lead to better health outcomes and academic success (Martinez, Frongillo, Leung, & Ritchie,

2018). The present findings were in accord with these studies, such that a significant negative correlation emerged between the diagnosed students' AFSSM scores and their GPA. However, no significant relationship between the AFSSM scores and GPA was found for the undiagnosed students. Thus, the following hypothesis was only supported for the diagnosed students, i.e., there would be a significant inverse correlation between AFSSM scores and GPA for food insecure students with and without disorders. These findings suggest that, for the present sample, GPA was impacted by both food insecurity and the presence or absence of a diagnosed disorder. Additional findings revealed no significant difference between the mean scores of the two groups on the Academic Progress Scale (APS). These findings failed to support the hypothesis that students with disorders would earn a significantly lower mean score on the APS than students without disorders. This suggests that the students' class attendance, attention span in class, and their understanding of concepts taught in class (i.e., the items comprising the APS) were not adversely impacted by a diagnosed disorder. However, a larger proportion of the food insecure students with disorders selected the "poor" or "fair" responses when rating their attention span in class. It can be speculated that the higher proportion of diagnosed students selecting these responses may be at least partially attributed to the number of students self-reporting a diagnosis of either Attention Deficit Hyperactivity Disorder or Attention Deficit Disorder ($n = 22$ and $n = 16$, respectively).

Several investigators examining the problem of college student food insecurity have developed Coping Strategy Scales (CSS) to identify the most common behaviors used to access food by this population. These researchers have analyzed the differences in median scores and interquartile ranges for food secure and food insecure students, with findings suggestive of higher use of coping strategies by those who are food insecure (McArthur, Ball,

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Danek, & Holbert, 2018). The present study, however, did not find a significant difference between the median scores on the CSS of the diagnosed and undiagnosed students. Therefore, these findings failed to support the hypothesis that students with disorders would use a significantly greater number of strategies from the CSS than students without disorders. Furthermore, the present findings revealed significant positive correlations between AFSSM and CSS scores for both the diagnosed and undiagnosed students, supporting the hypothesis that such an association would exist for both student groups. These findings suggest that a factor other than the presence or absence of a diagnosed disorder, such as food deprivation, promoted their adoption of food access behaviors. The coping strategies most often identified in previous research for food insecure college students include purchasing cheap, processed foods and eating less healthy foods to eat more (McArthur, Ball, Danek, & Holbert, 2018). Findings from the present research identified similar coping strategies used by the food insecure students with and without disorders. For example, both groups reported bringing food back to school after visiting family, friends, and/or significant others and eating smaller meals/portions. These findings imply that students avoided hunger by relying on their social support systems and by rationing food into smaller portions to stretch their food supply. An additional coping strategy used frequently by both the undiagnosed and diagnosed students was to eat less healthy meals to eat more, suggesting the consumption of an energy-dense diet featuring refined grains, and added sugars and fats.

The findings related to food group consumption suggest that the students' food security status strongly determined their food consumption patterns. To illustrate, findings indicated that as the food security status of the diagnosed students became more severe, their daily average consumption of vegetables significantly decreased. Similarly, fruit and

vegetable consumption declined among the undiagnosed students as their food security status worsened. These findings supported the hypothesis that among students with and without disorders, there would be a significant negative correlation between their AFSSM scores and their frequency of consuming fruits and vegetables.

Researchers have reported a high frequency of eating out by college students, implying that students choose to purchase ready-prepared foods from fast food and other restaurant outlets to perform less meal planning and preparation activities (Lin, Frazao, & Guthrie, 1999; Hertzler & Bruce, 2002). In regard to cooking competency, previous studies have found that college students perceive their cooking skills as "excellent" and report having enough experience to prepare a variety of meals (Hertzler & Frary, 1995; Hertzler & Bruce, 2002). Notably, in the present study, similar proportions of food insecure students with and without disorders regarded their frequency of food preparation as "Sometimes" or "Often," and rated their cooking skills as "Excellent" or "Good". These findings supported the hypothesis that the students with and without disorders would rate their cooking skills as "good/excellent." Such high frequencies of cooking suggest that the food insecure participants may use food preparation as a sustainable strategy for budgeting food money, since regular consumption of convenience and ready-prepared foods may be a more expensive option (Drewnowski & Specter, 2004).

The transitional period from financial dependence to financial independence that occurs during young adulthood may result in new economic burdens and instability. Several authors have noted that, among low income students, food insecurity is likely associated with their financial disadvantages (Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez, 2014). However, findings from the present study concerning the students' financial status

showed no significant associations between AFSSM scores and personal monthly or annual family incomes. These findings failed to support the hypothesis that among students with and without disorders, there would be significant inverse correlations between these variables. In contrast to findings from previous studies, the present findings suggest that the students' food insecurity was not significantly influenced by income. In addition to the challenge of limited income, the rising cost of higher education and student debt are other economic burdens facing many college students (West, Shanafelt, & Kolars, 2011; Ulbrich & Kirch, 2017). In the present study, a majority (60%) of the overall sample of food insecure students reported receiving financial aid, and a significantly larger proportion of the food insecure students with disorders were financial aid recipients compared to their undiagnosed peers. Despite the substantial reliance on financial assistance, college students of low socioeconomic status also often hold one or more part-time jobs to pay expenses (Judith & Emil, 1983). In this regard, studies have found that food insecure students were more likely to have a job than their food secure peers (Hughes, Serebryanikova, Donaldson, & Leveritt, 2011; Bruening, et al., 2016). The present findings support this trend, such that approximately 66% of the food insecure students with disorders and 58% of those without disorders reported having one or more part-time jobs.

The stronger reliance on financial assistance and part-time employment among the food insecure students with disorders may be attributed to the cost burden related to diagnostic tests and treatment strategies (Hall & Wise, 1995). This speculation is supported by findings from the Money Expenditure Scale (MES), indicating that the food insecure students with disorders scored significantly higher on this scale compared to the students without disorders. This finding supported the hypothesis that a greater proportion of students

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with disorders would report spending "sometimes/often" on health care related items than students without disorders. This suggests that the former group spent more money on non-food items, such as prescribed medications, over-the-counter medications, and health care appointments. However, findings revealed no significant association between the diagnosed students' AFSSM and MES scores. This finding failed to support the hypothesis that among the students with disorders, there would be a significant positive correlation between these two variables. Furthermore, other researchers have speculated that the knowledge deficit concerning financial literacy among college students could lead to irresponsible purchasing decisions and ultimately to deprioritizing nutrient-dense foods (Hagedorn & Olfert, 2018). It is noteworthy, therefore, that the food insecure students with and without disorders in the present study did not frequently spend money on non-essential items such as alcohol or entertainment. Instead, a significant amount of money was allocated to gasoline and personal hygiene items. This finding supported the hypothesis that the two items from the MES receiving the greatest number of "sometimes/often" responses by the students with and without disorders would be "gasoline" and "personal items."

The perceived barriers to adequate food access on-campus selected most often by the overall sample of food insecure students concerned food quality and variety. In contrast, the perceived barriers for the off-campus location focused on student knowledge deficits about how to ask for help accessing food, time constraints, and the inconvenience of food purchasing and preparation. Such barriers were comparable for food insecure students with and without disorders. These findings suggest themes for intervention programs focusing on skill-building for overcoming campus and community barriers to food access. No significant difference was found between the number of barriers to food access for combined on and off-

campus locations identified by the students with and without disorders. This finding failed to support the hypothesis that students with disorders would identify a significantly greater number of barriers on and off-campus than students without disorders.

The overall sample of food insecure students in the present study identified several types of social support that they believed would improve their food access, including lower priced nutritious foods at on-campus dining halls and markets, less expensive meal plan cards, and a wider variety of nutritious food options at on-campus locations. Findings revealed similar average numbers of types of social support identified by the students with and without disorders. This finding suggests that the presence or absence of a disorder had minimal influence on the number of sources of social support perceived as helpful for increasing their food access. These findings failed to support the hypothesis that students with disorders would identify a greater number of sources of social support compared to their undiagnosed peers. Food insecurity research has suggested that affected individuals commonly identify friends and family as sources that lessen the burden of food insecurity by offering instrumental and emotional support (Ahluwalia, Dodds, & Baligh, 1998; De Marco, Thornburg, & Kue, 2009). Specifically, such research has found that food insecure persons may trade or share food, participate in a community garden, or receive money in the form of loans or grants for food from others (Davis, Grutzmacher, & Munger, 2016). These authors also identified several learning opportunities related to teaching budgeting skills for cutting food cost when grocery shopping, eating out, and living expenses.

5.2 Suggested Policies and Programs for Reducing Student Food Insecurity at

Appalachian State University

Food insecurity is a multifactorial problem reflecting inequities in social determinants of health (http://www.fao.org/state-of-food-security-nutrition/en/). Implementing sustainable policies and programs to alleviate student food insecurity and hunger at Appalachian State University needs to begin by disseminating information about the scope of this problem to university administrators (e.g., student advisers, the on-campus student health center, Deans' offices, professors, the Honors College, fraternities and sororities, and student clubs), community partners (e.g., the Hunger and Health Coalition, Hospitality House, and local food pantries and food banks), and local and state policy-makers. Researchers studying this problem should facilitate evidence-based presentations and discussions with such influencers. Presentations should convey current findings concerning prevalence rates and coping strategies and advocate for long-term solutions.

Campus-wide efforts to combat student food insecurity at Appalachian State University have thus far included the opening of the food pantry at East Hall by the Office of Sustainability in 2016. This resource is available to students, staff, faculty, and their families. The pantry receives financial support and food donations from local grocery stores and farmers' markets, other community businesses and organizations, academic departments, individuals, and student clubs. However, with a continuous need for stock replenishment, an increase in community marketing and fundraising is vital to sustain the pantry's operational demands. Other universities have opened campus food pantries as a short-term solution to student hunger. Such efforts have received positive feedback from student shoppers, and campus administrators have reported a reduction in the rate of student food insecurity

(Anderson, 2016; Twill, Bergdahl, & Fensler, 2016). Research has recently been completed at Appalachian State University that measured student use and perceptions of the food pantry (i.e., the physical environment, food offerings, and customer service) to identify areas in need of improvement to more effectively serve students (McArthur, Farris, Fasczewski, & Petrone, 2019, under review). Additionally, the Student Government Association at Appalachian State University has introduced a pilot meal donation program, Mountaineer Swipes, that allows students to donate unused meal plan funds to students lacking money for food. Challenges associated with this program that are currently being considered are how to implement measures that would anonymize the recipients of the donated funds and simplify the money transfers. If implemented long-term, this program would address a primary perceived barrier to adequate food access on-campus identified by the participants in this research, i.e., insufficient meal plan funds. Other campuses have successfully implemented similar meal card fund transfer and meal donation programs. An example is a Swipe Out Hunger campaign where students donate extra meal swipes at dining hall check out points and the money is deposited into a meal credit account. The funds are subsequently distributed to pre-identified students facing hunger (http://www.swipehunger.org/).

While emergency food assistance programs such as campus food pantries, cooking classes, meal donation programs, and campus gardens benefit students in the short-term, long-term skill-building activities and employment opportunities at the campus and community level are essential to achieve and sustain food security among this population. One proposed effort would be for the Appalachian State University general education curriculum to offer nutrition education modules that teach students budgeting skills for budgeting food dollars and shopping for food on a limited budget, cooking skills for planning

and preparing low-cost nutritious meals, and gardening skills for participating in campus and community gardening programs. Research with food insecure students at other campuses has shown that students perceive college as the most appropriate time to learn practical life skills, suggesting that students would be receptive to such educational interventions (Watson, Malan, Gilk, & Martinez, 2017). Additionally, increasing federally-funded programs, such as work-study positions and assistantships, could provide the financial assistance needed for education and living expenses. Lastly, there is a need for advocacy for policy interventions at both state and federal levels. For example, making it easier for students to complete the application process for enrollment in the Supplemental Nutrition Assistance Program (SNAP) could improve the food deficit for eligible students.

5.3 Study Limitations and Strengths

This research had limitations that prevent the generalizability of the findings to the population of U.S. food insecure college students. These limitations include: use of a nonprobability sample, data collection on a single campus, self-reporting of all measures, overrepresentation of female students, and limited race/ethnic diversity. An additional limitation is the low Cronbach alpha coefficient for the MES, indicating a limited internal consistency among the scale items. Nevertheless, these findings contribute information to the literature about college student food insecurity by measuring rates and identifying correlates among food deprived students with diagnosed medical and learning disorders., a population that has thus far received little attention.

5.4 Areas for Future Research

The findings from this research showed a higher prevalence of food insecurity among students with diagnosed medical and learning disorders compared to their food insecure peers without such disorders. Accordingly, future research conducted at Appalachian State University should identify the types of assistance beyond existing campus efforts that would most effectively improve food access for this vulnerable cohort of food insecure students. Additionally, nationwide studies are needed to document the scope of food insecurity among students burdened with such disorders. Such studies should include larger and more diverse samples to identify specific sociocultural and economic correlates that need to be addressed to most effectively assist these students.

5.5 Conclusions

The food insecure students with diagnosed medical and learning disorders in the present study showed a higher prevalence of food deprivation than their food insecure peers without such disorders. The transitional period into post-secondary education brings with it new social and environmental circumstances in addition to the financial burdens related to tuition and living expenses. Collectively, these challenges may be contributing to the high rates of college student food insecurity documented at public and private two-year and four-year institutions nationwide (Pancer, Hunsberger, Pratt, & Alisat, 2000; Cason & Wenrich, 2002; Kerr, Johnson, Gans, & Krumrine, 2004). Additionally, students who are challenged with disorders appear to be even more vulnerable to food insecurity compared to their undiagnosed peers. The present findings reinforce the need to implement additional services that would improve access to nutritious foods and alleviate hunger, especially among students with medical and learning disorders at Appalachian State University.

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Appendix A

Recruitment Invitation Letter

Hello ASU Student!

You are invited to take part in a study about usual access to food among students with and without diagnosed disabilities. If you are 18 years or older and an enrolled student at ASU, you are eligible to participate.

If you agree to participate, we will ask for about 10 to 15 minutes of your time to complete a self-administered, anonymous questionnaire online. Your participation would be very valuable since the answers you provide will help us to design activities about how to enhance student access to nutritious food. We do not anticipate that you will experience any risks from completing this questionnaire, and the only inconvenience we foresee is the time it takes to answer the questions.

Your participation in this study is strictly voluntary, and you are free to stop answering questions at any time without penalty of any kind. Please understand that no compensation or academic credit is being offered for your participation, although you may enter a drawing to win a $100 gift card from amazon.com.

Thank you for considering this invitation. If you have any questions about this study, please contact Dr. Laura McArthur, Dr. Melissa Gutschall, or Ms. Anna Jackson at the telephone numbers or e-mail addresses listed below.

Laura McArthur, PhD, RD, Associate Professor
Department of Nutrition and Health Care Management, Appalachian State University
Telephone (828) 262-2971; Email address mcarthurlh@appstate.edu

Melissa Gutschall, PhD, RD, LDN, Associate Professor
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Anna Jackson, Graduate Student
Department of Nutrition and Health Care Management, Appalachian State University
Telephone (980) 241-3936; Email address jacksonam3@appstate.edu

The Appalachian State University Institutional Review Board (IRB) has determined that this study is exempt from IRB oversight.

By continuing to the research procedures, I acknowledge that I am at least 18 years old, have read the above information, and agree to participate.

Please click here to begin the survey:
https://appstate.az1.qualtrics.com/jfe/form/SV_9TZxTTbC9fkLLw1

Letter of Informed Consent

Hello ASU Student!

You are invited to take part in a study about usual access to food among students with and without diagnosed disabilities. If you are 18 years or older and an enrolled student at ASU, you are eligible to participate.

If you agree to participate, we will ask for about 10 to 15 minutes of your time to complete a self-administered, anonymous questionnaire online. Your participation would be very valuable since the answers you provide will help us to design activities about how to enhance student access to nutritious food. We do not anticipate that you will experience any risks from completing this questionnaire, and the only inconvenience we foresee is the time it takes to answer the questions.

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Thank you for considering this invitation. If you have any questions about this study, please contact Dr. Laura McArthur, Dr. Melissa Gutschall, or Ms. Anna Jackson at the telephone numbers or e-mail addresses listed below.

Laura McArthur, PhD, RD, Associate Professor
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The Appalachian State University Institutional Review Board (IRB) has determined that this study is exempt from IRB oversight.

By continuing to the research procedures, I acknowledge that I am at least 18 years old, have read the above information, and agree to participate.

Please click here to begin the survey:
https://appstate.az1.qualtrics.com/jfe/form/SV_9TZxTTbC9fkLLw1

Appendix C

Questionnaire

Hello ASU Student!

You are invited to take part in a research study about your usual access to food. This study is being conducted by Drs. Laura McArthur and Melissa Gutschall and by graduate student Anna Jackson from the nutrition program at Appalachian State University (ASU). If you agree to participate, we will ask for about 10 to 15 minutes of your time to complete a self-administered online questionnaire.

Your participation in this study is strictly voluntary, and you are free to stop answering questions at any time. We do not anticipate that you will experience any inconvenience from completing this questionnaire other than the time it takes to answer the questions. Please understand that no compensation or academic credit is being offered for your participation, although you may enter a drawing to win a $50 amazon.com gift card. Your participation would be very valuable to us since the answers you provide will help us to design activities about how to enhance student access to nutritious food.

We assure you that the answers you give will not be connected to your email address and that only group answers, not individual answers, will be analyzed to get our findings.
Thank you for considering this invitation. If you have any questions about this study, please contact Drs. Laura McArthur or Melissa Gutschall or Anna Jackson at the telephone numbers or e-mail addresses listed below.

Respectfully,
Laura McArthur, PhD, RD, Associate Professor
      Department of Nutrition and Health Care Management, Appalachian State University
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Anna Jackson, Graduate Student
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      Telephone: (980) 241-3936; Email Address jacksonam3@appstate.edu

Questions regarding the protection of human subjects may be addressed to the IRB Administrator, Research Protections, Appalachian State University, Boone, NC 28608 (828) 262-2692, irb@appstate.edu

Appalachian State University's Institutional Review Board has determined this study to be exempt from IRB oversight.

Part One
These first questions ask about your access to food since enrolling at Appalachian State University (ASU), whether you live on or off campus. Please check the button with the answer that BEST applies to you. Please do not leave any questions unchecked.
As a student at ASU …

1. Which statement best describes the food available to you as a student at ASU? Check your answer.
_____ Enough of the kinds of food I want to eat
_____ Enough, but not always the kinds of food I want to eat
_____ Sometimes not enough to eat
_____ Often not enough to eat

2. I have worried whether my food would run out before I got money to buy more.
        Often   Sometimes   Never

3. The food I have to eat just doesn't last, and I don't have money to get more.
        Often   Sometimes   Never

4. I can't afford to eat balanced meals.
        Often   Sometimes   Never

5. There have been times when I have cut the size of my meals or skipped meals because I didn't have enough money for food.
        Yes   No

If you answered "Yes" to question 5, please complete question 6. Otherwise, skip to question 7.

6. How often did this happen?
_____ Almost every month
_____ Some months, but not every month
_____ In only one or two months

7. There have been times when I have eaten less than I thought I should because I didn't have enough money for food.
        Yes   No

8. There have been times when I was hungry but didn't eat because I didn't have enough money for food.
        Yes   No

9. I have lost weight because I didn't have enough money for food.
        Yes   No

10. There have been times when I have not eaten for a whole day because I didn't have enough money for food.

       Yes   No

If you answered "Yes" to question 10, please complete question 11. Otherwise, skip to question 12.

11. How often did you not eat for a whole day because there wasn't enough money for food?
_____ Almost every month
_____ Some months, but not every month
_____ In only one or two months

12. Below is a list of different health conditions that some college students experience. Which of the following conditions have you been diagnosed with by a health care professional, e.g., physician, nurse, psychologist, dietitian, etc.? Please check all that apply to you personally.

    ___Acid reflux (heartburn)
    ___Alcohol addiction
    ___Anemia
    ___Anorexia nervosa
    ___Arthritis
    ___Asperger syndrome
    ___Asthma
    ___Attention deficit disorder (ADD)
    ___Attention deficit hyperactivity disorder (ADHD)
    ___Auditory processing disorder or central auditory processing disorder
    ___Autism
    ___Back pain
    ___Binge eating disorder
    ___Bipolar disorder
    ___Body dysmorphic disorder
    ___Bone fractures
    ___Borderline personality disorder
    ___Bulimia nervosa
    ___Cancer
    ___Carpel tunnel syndrome
    ___Celiac disease
    ___Cerebral palsy
    ___Chronic fatigue syndrome
    ___Cystic fibrosis
    ___Depression
    ___Diabetes type 1
    ___Diabetes type 2
    ___Drug addiction
    ___Dyslexia

___Dyspraxia
___Epilepsy
___Executive functioning condition
___Fibromyalgia
___Fish/seafood allergy
___Frequent abdominal cramps
___Frequent constipation
___Frequent diarrhea
___Frequent nausea
___Gallbladder disorders (gall stones, etc.)
___Generalized anxiety disorder
___Hearing impaired (total deafness, partial hearing, etc.)
___Heart disease
___High blood cholesterol
___HIV/AIDS
___Hypertension (high blood pressure)
___Indigestion
___Inflammatory bowel disease (IBD)
___Irritable bowel syndrome with constipation (IBSC)
___Irritable bowel syndrome with diarrhea (IBSD)
___Lactose intolerance
___Migraine headaches
___Milk allergy
___Multiple sclerosis
___Muscular dystrophy
___Nonverbal learning disability (NVLD)
___Nut allergies
___Obesity
___Obsessive-compulsive disorder (OCD)
___Osteoarthritis
___Osteopenia/osteoporosis
___Overweight
___Panic disorder
___Paraplegic or quadriplegic
___Partial or complete amputee
___Phobias
___Poly Cystic Ovarian Syndrome (PCOS)
___Post-traumatic stress disorder (PTSD)
___Rheumatoid arthritis
___Schizophrenia
___Seizure disorder
___Social anxiety disorder
___Soy allergy
___Tendinitis
___Tennis elbow
___Tourette syndrome

___Traumatic brain injury
___Ulcers
___Vertigo
___Visual perceptual motor deficit
___Visually impaired (total blindness, partial vision, etc.)
___Other: Please identify _____.

13. Below is a list of strategies that people use to get food when they have run out. Please indicate about how often you use each strategy during a typical semester by checking the box that best applies to you.

Sold textbooks
Never   Seldom   Sometimes   Often

Ate smaller meals/portions to make the food last longer
Never   Seldom   Sometimes   Often

Sold personal possessions to buy food (e.g., clothes, jewelry, etc.)
Never   Seldom   Sometimes   Often

Taken fewer classes to save tuition money to buy food
Never   Seldom   Sometimes   Often

Used less utilities (e.g. electricity, water) to buy food
Never   Seldom   Sometimes   Often

Held one or more jobs at the same time to have more money to buy food
Never   Seldom   Sometimes   Often

Used a credit card to buy food
Never   Seldom   Sometimes   Often

Planned menus before buying food
Never   Seldom   Sometimes   Often

Cut out food coupons
Never   Seldom   Sometimes   Often

Sold your blood/plasma to buy food
Never   Seldom   Sometimes   Often

Participated in a paid research study/clinical trial to buy food
Never   Seldom   Sometimes   Often

Borrowed money from family or friends to buy food
Never   Seldom   Sometimes   Often

Attended on-campus or community functions where there was free food
Never   Seldom   Sometimes   Often

Participated in a federal or state food assistance program (e.g. SNAP/Food Stamps, WIC, etc.)
Never   Seldom   Sometimes   Often

Taken leftover food home from on-campus dining hall
Never   Seldom   Sometimes   Often

Decreased medication dose or skipped medical appointments to buy food
Never   Seldom   Sometimes   Often

Stretched leftovers to make them last longer
Never   Seldom   Sometimes   Often

Shared grocery and/or meal costs with others
Never   Seldom   Sometimes   Often

Ate more than normal when food was plentiful
Never   Seldom   Sometimes   Often

Ate meals at places where you can "pay what you can" (e.g. FARM Café)
Never   Seldom   Sometimes   Often

Ate less healthy foods so you could eat more (cheap, processed food such as ramen noodles, frozen pizza, candy, etc.)
Never   Seldom   Sometimes   Often

Brought food back to school after visiting family, friends, significant others, etc.
Never   Seldom   Sometimes   Often

Stole money to buy food
Never   Seldom   Sometimes   Often

Accessed food from a food pantry (e.g., Hunger and Health Coalition, Hospitality House, church pantry, East Hall pantry on campus, etc.)
Never   Seldom   Sometimes   Often

Attended free meal events in the community (e.g., Hospitality House, churches, etc.)
Never   Seldom   Sometimes   Often

Dumpster diving to get food

Never   Seldom   Sometimes   Often

Accessed free food at your food-related job (e.g., restaurant, grocery store, dining hall, convenience store, etc.)

Never   Seldom   Sometimes   Often

Sold recreational or prescription drugs to get money for food

Never   Seldom   Sometimes   Often

Other: Please identify and rate _____

Never   Seldom   Sometimes   Often

Part Two

14. Please rate about how often you spend money on the following during a typical semester by checking the box that best applies to you.

Alcohol

Never   Seldom   Sometimes   Often

Cigarettes

Never   Seldom   Sometimes   Often

Recreational drugs

Never   Seldom   Sometimes   Often

Car repairs

Never   Seldom   Sometimes   Often

Gasoline

Never   Seldom   Sometimes   Often

Public transportation

Never   Seldom   Sometimes   Often

Pet care

Never   Seldom   Sometimes   Often

Tattoos

Never   Seldom   Sometimes   Often

Entertainment (e.g., concerts, movies, sports events, video games, etc.)
Never   Seldom   Sometimes   Often

Prescribed medications
Never   Seldom   Sometimes   Often

Over-the-counter medications (e.g., pain relievers, digestive medications, allergy medications, etc.)
Never   Seldom   Sometimes   Often

Medical supplies (e.g., glucose testing supplies, medical foods, etc.)
Never   Seldom   Sometimes   Often

Health care appointments, including travel expenses to appointments
Never   Seldom   Sometimes   Often

Medical devices/equipment, including maintenance expenses (e.g., wheelchair, hearing aids, glasses/contact lenses, prosthetic devices, etc.)
Never   Seldom   Sometimes   Often

Personal items (e.g., clothes, makeup, etc.)
Never   Seldom   Sometimes   Often

Personal hygiene items (e.g., soap, toothpaste, deodorant, etc.)
Never   Seldom   Sometimes   Often

15. Do you have regular access to enough food on campus to keep you from feeling hungry?

    Yes   No

16. Do you have regular access to enough food off campus to keep you from feeling hungry?
    Yes   No

If you answered "yes," to either question 15 or 16, please answer question 17. Otherwise, skip to question 18.

17. Please check all of the factors that make it difficult for you to access enough food on a daily basis on or off campus or at both locations by checking all of the boxes that apply to you.

I require assistance with mobility that makes accessing food difficult (e.g., person, wheelchair, scooter, service dog, cane, etc.)

On Campus   Off Campus   Both Locations

I feel overwhelmed/stressed planning meals or making food choices

On Campus   Off Campus   Both Locations

I don't have time to purchase food

On Campus   Off Campus   Both Locations

I don't know how to ask for help accessing food

On Campus   Off Campus   Both Locations

I don't have time to eat regular meals

On Campus   Off Campus   Both Locations

 I have safety concerns getting food at certain times of day

On Campus   Off Campus   Both Locations

Food preparation is inconvenient

On Campus   Off Campus   Both Locations

Foods are not always healthy/nutritious

On Campus   Off Campus   Both Locations

 My meal plan runs out

On Campus   Off Campus   Both Locations

 I don't have enough money to purchase healthy/nutritious foods

On Campus   Off Campus   Both Locations

 I feel embarrassed to ask for help accessing food

On Campus   Off Campus   Both Locations

I need assistance accessing or preparing food

On Campus   Off Campus   Both Locations

I don't have transportation

On Campus   Off Campus   Both Locations

I don't have food preparation skills

On Campus   Off Campus   Both Locations

I don't have cooking equipment

On Campus   Off Campus   Both Locations

Available foods are not culturally appropriate

On Campus   Off Campus   Both Locations

My family doesn't want me to ask for help accessing food

On Campus   Off Campus   Both Locations

Available foods do not support my religious beliefs

On Campus   Off Campus   Both Locations

Available foods are not familiar to me

On Campus   Off Campus   Both Locations

Available foods do not support my special dietary needs (e.g., allergy, intolerance, vegetarianism, etc.)

On Campus   Off Campus   Both Locations

 I can't find the foods I like

On Campus   Off Campus   Both Locations

I don't know where to find places to get food

On Campus   Off Campus   Both Locations

I am not interested/motivated to access food

On Campus   Off Campus   Both Locations

I don't know where to get information about food ingredients

On Campus   Off Campus   Both Locations

Available foods do not taste good to me

On Campus   Off Campus   Both Locations

Other: Please identify _____

On Campus   Off Campus   Both Locations

18. Please indicate which types of assistance would improve your access to food by checking all the boxes that apply.

___Provide a wider variety of food options at on-campus locations	___Less expensive meal plan cards	___Learn time management for meal planning and preparation
___Provider a wider variety of food options at community food outlets like grocery stores and restaurants	___Lower priced nutritious foods at on-campus dining halls and markets	___Learn how to shop for food
___Provide more nutritious food options at on-campus locations	___More work study job opportunities	___Learn how to make nutritious food options
___ Provide more nutritious food options at community food outlets like grocery stores and restaurants	___Personal assistance with shopping, preparing, and cooking food	___Learn how to follow my special diet
___Provide better transportation to on-campus dining and food services including the on-campus food pantry	___Get a roommate	___Learn how to plan meals
___Provide better transportation to community food outlets	___More financial aid at school	___Learn how to eat healthy

___Provide more allergen-friendly food options and labeling information at on-campus locations

___Financial help from others (e.g., parents and friends)

___Learn how to grow food

___Provide more allergen-friendly food options and labeling information at food outlets like grocery stores and restaurants

___Learn how to make a budget for living expenses

___Learn how to access foods that meet my cultural needs

___Extend operational hours of on-campus dining halls and markets

___Learn how to budget food money for eating out

___Other: Please identify

___Make dormitory cooking equipment more accessible

___Learn how to cut cost when grocery shopping

19. Did you know that there is a food pantry on the bottom floor of East Hall?
     Yes   No

20. Have you ever accessed food from the food pantry at East Hall?
     Yes   No

For the following four questions, please rate your school performance by checking the box that best applies to you.

21. My overall progress in school including graduating on time
Poor   Fair   Good   Excellent

My class attendance
Poor   Fair   Good   Excellent

My attention span in class
Poor   Fair   Good   Excellent

My understanding of concepts taught in class
Poor   Fair   Good   Excellent

22. My current GPA is (drop-down menu)

Part Three
These final questions ask for information about you and your lifestyle. All of your answers will be kept confidential. Please check the answers that best apply to you, or write the answer in the textbox provided.

23. The gender I identify with is:
___ Male
___ Female
___ Other

24. My age is _____years

25. My marital status is
    ___ Not married
    ___ Married

26. I have dependent children living with me
    Yes   No

If you answered "yes" to question 26, please indicate how many dependent children live with you. Otherwise skip to question 28.

27. Please indicate how many dependent children live with you

28. I currently weigh about: ___ pounds

29. My height is about: (drop down menu) _____ feet, _____ inches

30. My year in school is
___ Freshman
___ Sophomore
___ Junior
___ Senior
___ Graduate Student
___ Other: please identify _____

31. I am an international student
    Yes   No

32. My student status at ASU is:
    ___ Part-time student
    ___ Full-time student

33. My major at ASU is in
    ___ Beaver College of Health Sciences
    ___ College of Arts and Sciences
    ___ College of Fine and Applied Arts
    ___ Hayes School of Music
    ___ Reich College of education
    ___ Walker College of Business

34. My race/ethnic background is: Check all that apply
    ___ African-American, not of Hispanic origin
    ___African-American, White
    ___American Indian
    ___ Asian
    ___ Hispanic
    ___ Pacific Islander
    ___ White, not of Hispanic origin
    ___ Other: please identify _____

35. My employment status is:
    ___ Unemployed
    ___ One or more part-time jobs
    ___ One full-time job
    ___ Other: please identify _____

36. I live:
    ___ On-campus
    ___ Off-campus
    ___ I am homeless

37. I currently receive income from some type of financial aid like a scholarship, grant, private or federal loan
    Yes   No

38. My personal (not family) monthly income falls between:

    ____ $0-$500
    ____ $501-$1000
    ____ $1001-$1500
    ____ $1501+

39. My family (not personal) yearly income falls between:

____ $0-$15,000
____ $15,000-$24,999
____ $25,000-$34,999
____ $35,000-$49,999
____ $50,000-$74,999
____ $75,000-$99,999
____ $100,000-$149,000
____ $150,000-$199,999
____ $200,000+

40. I would rate my current health as:
    Poor   Fair   Good   Excellent

41. I currently participate in an on-campus meal plan
    Yes   No

42. I cook for myself or for others:
    Often   Sometimes   Never

43. Please estimate the number of times per day that you eat from each of the following food groups by checking the number that best applies to you.

Food group													
Grains/cereals (e.g. breakfast cereals, breads, crackers, noodles, other pastas, rice, sweet pastries/cookies/cake, etc.)	0	1	2	3	4	5	6	7	8	9	10	11	12
Vegetables/juices (e.g. potato, carrot, green leafy vegetables, corn, broccoli, etc.)	0	1	2	3	4	5	6	7	8	9	10	11	12
Fruits/juices (e.g. apple, orange, tomato, peach, grape, etc.)	0	1	2	3	4	5	6	7	8	9	10	11	12
Meat/fish/poultry (e.g. beef, pork, chicken, fish, shellfish, etc.)	0	1	2	3	4	5	6	7	8	9	10	11	12
Other protein foods (e.g. eggs, peanut butter, nuts, seeds, soy foods, different beans other than green beans, etc.)	0	1	2	3	4	5	6	7	8	9	10	11	12
Dairy foods (e.g. fat-free or regular milk, block cheese, cottage cheese, ice cream, yogurt, etc.)	0	1	2	3	4	5	6	7	8	9	10	11	12
Sweets (e.g. hard/gummy candy, candy bars, regular soft drinks, jams/jellies, honey, table sugar, etc.)	0	1	2	3	4	5	6	7	8	9	10	11	12

44. Please check the food group(s) that you would eat more from if you had greater access.

___ Grains/cereals (e.g. breakfast cereals, breads, crackers, noodles, other pastas, rice, sweet pastries/cookies/cake, etc.)

___ Vegetables/juices (e.g. potato, carrot, green leafy vegetables, corn, broccoli, etc.)

___ Fruits/juices (e.g. apple, orange, tomato, peach, grape, etc.)

___ Meat/fish/poultry (e.g. beef, pork, chicken, fish, shellfish, etc.)

___ Other protein foods (e.g. eggs, peanut butter, nuts, seeds, soy foods, different beans other than green beans, etc.)

___ Dairy foods (e.g. fat-free or regular milk, block cheese, cottage cheese, ice cream, yogurt, etc.)

___ Sweets (e.g. hard/gummy candy, candy bars, regular soft drinks, jams/jellies, honey, table sugar, etc.)

45. As a student, I generally feel _____ about my food situation. Check all that apply.

Satisfied	Secure	Pleased	Fine/OK	
Embarrassed	Ashamed	Guilty	Humiliated	Deprived
Anxious	Worried	Insecure	Helpless	
Angry	Resentful	Sad	Frustrated	

Other: please identify _____

46. I could use ____ support to help me access food. Check the answer that best applies to you.

___ A lot more

___ Some more

___ A little more

___ I do not need more help accessing food

Thank you for completing this questionnaire!

Below is a list of resources that may help you access food and other types of support:

Appalachian State University Food Pantry at East Hall (food, school supplies, winter gear, interview clothing, basic hygiene)
828-262-2659
175 Locust Street
Boone, NC 28608

Website: https://sustain.appstate.edu/initiatives/food-pantry/

Hunger and Health Coalition (food pantry and low-cost prescription medications)
828-262-1628
141 Health Center Drive #C
Boone, NC 28607

Website: https://www.hungerandhealthcoalition.com

Appalachian State University Counseling & Psychological Services Center
828-262-3180
1st Floor, Miles Anna's Building
Boone, NC 28608

Website: https://counseling.appstate.edu

Vita

Anna Marie Jackson was born in Charlotte, North Carolina to Kenneth and Lisa Jackson. She developed her passion for nutrition at Appalachian State University, earning her Bachelor of Science in Nutrition and Dietetics in May of 2017. In the fall of 2017, she started a dual Master's of Science in Nutrition and Dietetic Internship program at Appalachian State University. She hopes to work as a clinical Registered Dietitian Nutritionist specializing in nutrition support.